

MOTOR VEHICLE PEDESTRIAN MORTALITY IN SOWETO FROM 2001 to 2005

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A research report submitted to the, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Public Health

Johannesburg 2011

DECLARATION

I, James Blair Mwesigwa declare that this dissertation is my own work. It is being submitted for the degree of Master of Public Health, to the School of Public Health, Faculty of Health Sciences, University of the Witwatersrand. It has not been submitted before, in part or whole, for any degree or examination in any other University.

_____ day of _____ 2011

This work is dedicated firstly, to my very good friend, Lindiwe Mkwebane, who has been such a pillar of strength during this entire MPH project, and secondly, to the numerous boys and girls, including my son Emmanuel, who proudly participate in "Scholar patrols", and who, hopefully in their adolescence and adulthood will go on become dependable community advocates not only on the issues around safer roads, but also on issues around safer communities as a whole.

ABSTRACT

In South Africa, injury remains one of the major causes of death. International data also suggests that intentional and unintentional deaths are on the increase globally with highest increases noted in the middle and low income economies. The National Injury Mortality Surveillance System (NIMSS) which captures only 40% of all annual non-natural deaths revealed that 27% of these deaths occurring mainly in adults and children are motor vehicle related. 58% of these are pedestrians. The rationale of this study stems from the findings for the National Injury Mortality Surveillance System (NIMSS) of 2002, which indicated a high pedestrian mortality. This study is a descriptive cross sectional analysis of pedestrian related mortality data from an existing NIMSS database. Continuous variables were summarised using means and standard deviation while categorical variable were summarised using proportions. Summary data were presented in graphs and tables. This was conducted using a statistical programme STATA10. Between 2001 and 2005, motor vehicle transport related deaths comprised 11.32% of all recorded un-natural deaths in Soweto with pedestrians accounting for 50% of deaths. The Pedestrian mortality comprised the dominant proportion of all motor vehicle related mortality from 2001 to 2005 (compared to drivers, passengers and unspecified road user categories). From the results of the study, it was shown that most pedestrian deaths occurred in the black population group, followed by coloureds. It also confirmed that the majority of pedestrian deaths were of the male gender group. With regards to time and day of death, it concluded that pedestrian deaths occurred in between 1800h and 2400h, mainly over weekends, whereas by age group, age group, most pedestrian fatalities were adolescents and young adults followed by children. When it came to access to emergency medical care, the study showed that the majority of dead pedestrians were never attended to by Emergency Medical personnel. Blood alcohol concentrations were raised in a high percentage of those fatalities in whom it was possible to measure such concentrations, suggesting that alcohol played a significant role in pedestrian deaths. A number of preventative and advocacy initiatives are recommended, with emphasis on broad based stake holder participation, education, engineering, as well as targeted interventions that address specific issues that were identified as major contributing factors to the observed increased vulnerability in those specific categories of pedestrians.

ETHICAL APPROVAL

The protocol (Protocol number M080337) for this research was approved unconditionally by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand on 2008-03-25.

AKNOWLEDGMENTS

1. Dr Khin Tint, previously of The School Of Public Health, the University of the Witwatersrand, now with the National Institute of Communicable Diseases, for kindly agreeing to supervise the Study, and for being such a inspiration when the going was tough.

2. Staff and the entire Institution of Medical Research Council-Crime, Violence and Injury Programme, (MRC and UNISA Institute for Social and Health Sciences), and in particular Professors M A Sedat and Kopano Ratele, who graciously allowed me to use the Institution's Database, time and other resources, and Luanne Swart of the same Institute for her invaluable constructive advice and criticism

3. The Department of Forensic Pathology, the University of the Witwatersrand, for allowing me time off to pursue my newly found passion in Public Health and Social Advocacy

4. The Gauteng Department of Health (Directorate Forensic Pathology Services) for the support and the faith in a Project which hopefully, will add value and contribute to better Health outcomes in the Province and in the country as a whole.

5. To Staff of the City Of Johannesburg's Corporate Geographical Information Systems, for their tremendous professional and timeous assistance and support with the Geographical Information Systems

6. Mr. Braimoh Bello of The Reproductive Health Research Unit, for assistance with statistical analyses of the Data sets.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Motor vehicle related injury is a leading cause of mortality in adolescents and young adults worldwide (Feachem, Kjellstrom, Murray, Phillips 1992)), the majority of which occur in developing countries (World Bank, 1993). That motor vehicle related morbidity and mortality is of a huge concern prompted the United Nations to declare that halving global motor vehicle related morbidity and mortality by 2014 was one of its Millennium Development Goals.

More recent studies examining the global patterns of mortality in young people (Patton, et al, 2009) confirms previous observations by (Ross, Baugley, Hills and Silcock1991) that there has been a dramatic increase in the proportion and absolute number of traffic related mortality in a number of developing countries, compared to a marked decrease in industrialized countries. According to Odero, Garner and Zwi (1997), traffic related injury accounted for between 30 and 80% of all trauma victims and with an overall mean length of stay in health care facilities, of 20 days. Patients who sustained spinal injury, head injury or compound fractures had the longest duration of hospitalization. Other indicators of hospital utilisation indicated that traffic involved patients represented between 13 and 31% of all injury related attendances, 48% of bed occupancy in surgical wards, and were the most frequent users of operating theatres and intensive care units. In addition, they increased workloads in X-ray departments, as well as the demand for physiotherapy and other rehabilitative services.

It then becomes abundantly clear that traffic related trauma exerts a considerable burden on the already constrained health care resources in developing countries and it would therefore be the basis of the study on the associated late mortality, long term morbidity and disability.

In South Africa, motor vehicle related mortality accounts for approximately 40% of all un-natural deaths and these trends have been observed by Matzopoulos Sukhai, van Niekerk (2002). Motor vehicle traffic related morbidity and mortality adversely affect the economies of the affected countries, and in some cases, have cost those economies as much as 1-2% of their Gross National Product (Fourace and Jacobs 1976, Downing et al 1991). Further, the roadside has been consistently shown to be a favourite place for informal traders (Figure 1). In some cases this is leading to conflict between road side traders and motor vehicle traffic, as the former appear to be encroaching into the space of motor vehicles (Afukar, Antwi and Ofosu 2003)



Figure 1: Informal traders on the kerbside and into the main road

Road traffic injuries are also being increasingly viewed as a Public Health problem, with motor vehicle traffic related morbidity and mortality comprising of a disproportionate burden on the economies of low and middle income economies (Haddon 1980). This burden is mostly felt by the poorest in these economies, which often have the least access to any form of social services (Nantulya, Reich 2003).

Not peculiar to road traffic but to railway traffic as well, people will often remove barricades previously erected by either the road or a railway line to create short cuts, even where safe crossing structures have been erected. As to whether these structures have fallen apart because of poor maintenance or because they have been removed by the communities remains to be established. The behaviour though, arising from or encouraged by the near total absence of safe demarcation constitutes risk.

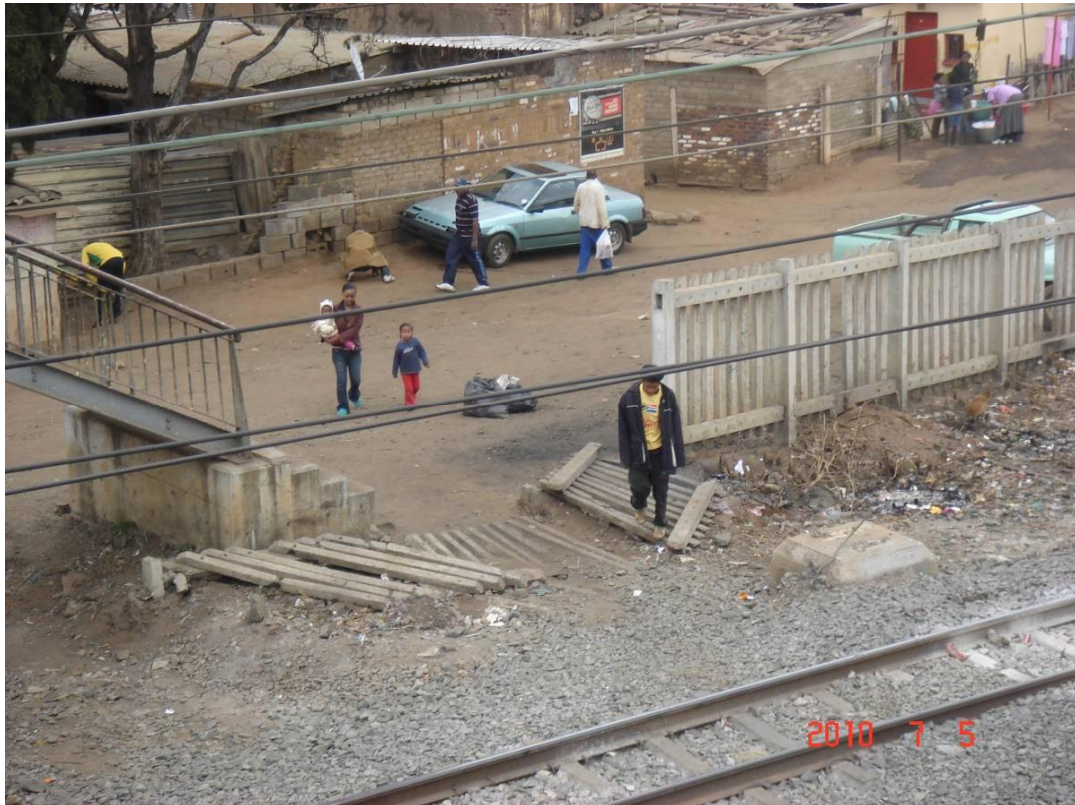


Figure 2: Dilapidated railway side infrastructure .Look how the provided safe passage is being ignored.

Due to the increasing incidence of road traffic related morbidity and mortality especially in the developing countries and their preventable nature, they will have to be factored into the whole Health Sector Reform agenda, if Equity in Health is to be achieved (Tim Evans, Brown H 2003).

1.1 Statement of the Problem

Soweto Township has a high pedestrian mortality according to the NIMSS report. However, NIMSS only reports on 40% of the annual non-natural deaths in the country leaving 60% of the annual non natural deaths unrecorded and unexplained. The Data set on which the Annual Reports "A Profile of Fatal Injuries in South Africa" is only collected from a few Mortuaries in Gauteng, Mpumalanga, Kwazulu Natal and the Western Cape. The rest of the Mortality data is collected and kept by various agencies such as the South African Police Service, and the Metropolitan Police, as well as other Health Facilities. This creates a huge information gap, both qualitatively and quantitatively, resulting in poor policy formulation and implementation. This information is not peculiar to South Africa but to other countries in the SADC region.

1.2 Objectives of the Study

The study is rationalized by the fact that it is important to establish the differential burden of injury and disease, as this is crucial when identifying priorities in planning for economic and social infrastructure in Soweto.

The broad objectives of this study are to determine the magnitude of the seasonal patterns of pedestrian mortality and to assess other key factors that influence the observed seasonal patterns. The result of this study will be used to recommend a comprehensive multi-sectoral and sustainable pedestrian mortality preventative strategy.

1.2.1 Specific Objectives

The specific objectives of this research are outlined below and are as follows:-

- a) To determine the magnitude of motor vehicle related mortality and describe its distribution in terms of person, place and time.
- b) To determine the seasonal patterns of pedestrian mortality as seen over the study period,
- c) To identify key factors that influences the observed patterns,

The study will be conducted in Soweto, located in the south west of Johannesburg, looking at pedestrian mortality from 2001 to 2005. In order to promote Public Health

Policies in Soweto on Road Safety, Data on Motor vehicle transport related mortality in Soweto over a period of five years (2001-2005) was examined to answer the following research questions:

- 1) What is the magnitude and pattern of motor vehicle related pedestrian mortality.
- 2) What are the key factors that influence these patterns?
- 3) How to design a pedestrian mortality preventative program that could be integrated with the existing preventative infrastructures in the area.

A few factors contributing to this problem in South Africa have been identified as day and time of death; demographic characteristics of the deceased, alcohol; topographic characteristics of the scene of the accident and the response from emergency services personnel and hospital services on the terminal outcome of the pedestrian incident. Some of these factors will be investigated further in this study. While NIMSS collects data on the deceased, other pertinent data will be missing such if the victim had poor eye sight, hearing problems mental illness, physical deformities that impair physical movement. All these factors have a big impact on the pedestrian's abilities to take evasive actions in the face of an oncoming vehicle.

In terms of the methodology used to capture the NIMSS data, (see annexure 2), a number of challenges have been identified, challenges that potentially impact on both the accuracy of the data with reference to place and time. No modern data capturing devices such as Global Position System devices are currently in use. In addition entries to the current NIMSS data form allows the data capturer a lot of subjectivity with regards of the actual interpretation of items for example where found open veldt, in the country side, place unknown etc. This subjectivity, inconsistency, and lack of precision in terms of the place has the potential of adversely affect the data both qualitatively and quantitatively.

This study hopefully will come up with specific recommendations that will address some of the issues narrated above. Depending on the results of the study, specific suggestions and recommendations will also be put forward to address pedestrian mortality prevention, such as education, research, environmental engineering, stakeholder identification and engagement, as well as statutory and social advocacy

The structure for the rest of the thesis is described below.

Chapter Two will give a literature review, discussing issues of road safety and mortality, vehicles and the road environment as well as demographic profiles of road accident victims.

Chapter Three will introduce the area of study and the data sets employed in the study as well as the research methods applied to answer the research questions outlines above.

Chapter Four. The results of the study are presented.

Chapter Five. In this chapter, the results are presented and discussed.

Chapter Six shall comprise conclusion and the recommendations.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Trauma or physical injury remains one of the major causes of death in South Africa, and international research suggests that both intentional and non intentional deaths are on the increase worldwide.

In its review of transport related deaths by user category and population group for the entire South Africa in 2002, van Niekerk and Sukhai found that pedestrian deaths accounted for the highest percentage of transport related deaths among Blacks and Coloureds, while for Whites, most transport related deaths occurred among motor vehicle drivers. Among the Asians however, the percentages of driver, passenger, and un-specified were equally distributed. Blacks and Coloureds recorded the highest percentage of railway deaths, whereas cyclist deaths were highest among Whites.

2.1 Vehicles and the Road environment.

According to Haddon (1980) and Stanfield et al (1992), the circumstances surrounding motor vehicle traffic related morbidity and mortality incidents are a triad, comprising people such as drivers, passengers and pedestrians. This study is agreement with the sentiments of Haddon, (Haddon 1980, Stanfield et al 1992), who concluded that the circumstances surrounding a Motor vehicle Traffic related morbidity and mortality incident is a triad, comprising People such as drivers, passengers and pedestrians, Vehicles, and the Road environment.

Some of the major “people related factors” include human behaviour through related risk taking, where pedestrians fail to use designated safe road crossing overpasses, even when they are provided as illustrated in Figure 3. Understandably though, some of these

safe crossings are placed inappropriately, or are insufficient for the purpose, leaving pedestrians very little choice but to take the risky alternative (Figures 2.2, 5.1, 5.2).

Other human factors include the encroachment of humans on to kerb side and sometimes right into the road in pursuance of commercial activity.(Afukar, Antwi, Osofu 2003) and as seen in Figure 2.1.



Figure 2.1: Competition for space between motor vehicles, traders and pedestrians

Other human factors include:-

- Poor driving skills
- Non compliance with regards to the use of safety features such as seat belts and helmets in the case of motorbikes
- Driving under the influence of alcohol or drugs (intoxicated)
- Poor eye sight
- Wanton recklessness, where little regard is shown by drivers to the rules of the road or other road users (Wong, et al. 1990b)

- Poor judgment on the part of the pedestrian as to where and when it is safest to cross the road
- physical disabilities such as hearing and ocular defects that could impair judgment

Another human factor that is difficult to quantify is failure in policing and enforcement, often triggered by low pay and morale in the relevant movement agencies. It is not uncommon to read or experience incidences where, it is sometimes alleged that corrupt traffic officers have accepted bribes and consequently turned a blind eye to dangerous and wrongful human practices and behaviour on the road.(Nantulya, Reich 2003). It is also understood that the vehicle mix on the road, if not properly managed, can result in decreasing the risk profile of all categories of road users, as well as those using the pavements adjacent to the motorways as seen in Figure 2.2.(Afukar, Antwi and Osofu 2003).



Figure2.2: Speeding truck whooshes by pedestrians who are about to cross a section of N 12, South of Johannesburg.

2.2 Roads in Relation to Other Infrastructure

From an equity point of view however, there are other fundamental social factors that contribute to pedestrians resorting to unsafe road-user practices, such as when they must cross the road to access services, or when the authorities have not provided safe conduits such as overhead bridges. In the Figure 5.2, a single overpass serves as the only safe point of crossing for an informal settlement along the N12 in Eldorado Park, the settlement of which stretches for almost two kilometres along this free way. All the major social amenities are on the opposite side of the freeway, such as a school, a clinic, numerous shops and a bottle store. Clearly, a single overpass is not sufficient as an access route to these services. Thus the insufficiency of safe routes in many ways contributes to risky road crossing.

All these services interact with one another at one level or the other and to a large extent, they form a link between each other and human activity making road traffic accident complicated to analyze as they cross the boundaries of engineering, geography and human behaviour.

2.3 Motor Vehicles and the Road Environment

The second component of the triad is **vehicles**, which largely comprises of the state of the vehicle in terms of its Road worthiness as well as the vehicular traffic mix on the road.

The impact of vehicular and other road users mix has been investigated by a number of workers such as Mohan D (2000), in which he looked at the impact of motorized two wheeler use patterns in New Delhi, and was able to establish that the increased agility and manoeuvrability if the two wheelers made it much easier for the two wheeler drivers to encroach with easy into dedicated pedestrian spaces, and thus increasing the risk of pedestrian injury.

O'Neil and Mohan (2002) in their studies on reducing motor vehicle crash deaths and injuries in newly motorized countries also found that both the uncharacteristic road user mix of motor vehicles, bicycles, motorbikes human and animal traffic had a marked effect on the risk this mix posed not only pedestrians but to other road users as well.

Factors attributed to the third component of the triad, **road environment** include poor road design and maintenance, as well as other factors like poor visibility and lighting.

Elvick (2001) looked at traffic calming schemes in urban areas, and concluded that targeted road surface manipulation was an effective tool in calming traffic and that in such methods were used in conjunction with other non mechanical devices like robots , colour schemes, and real-time traffic monitoring systems , traffic calming schemes are an effective tool in enhancing pedestrian safety.

Ahmad and Ehsan (2008) also found that use of real time monitoring of road surface conditions and traffic flow using Closed circuit television and GPRS, were not only an effect deterrent against rogue drivers, but was also an effective way of monitoring, on a continuous basis, the road surface conditions, and were a reliable öearly warning systemö to the road management authorities, as the latter were the able to take the necessary pr-emptive corrective action to ensure both driver and pedestrian safety.

2.3.1 Demographic Profiles of Motor Vehicle Victims

An analysis of forty six published studies (Odero and Zwi, 1997), showed that males consistently outnumbered females among people killed in road traffic injuries: between 67 and 99.5% involved males., and even when they examined their data sets by type of road user, males were still over-represented in every category, especially amongst drivers, where they comprised between 87 to 100%. This could be explained in part by the greater exposure of men to traffic or increased risk due to other factors, given similar exposure levels. This preponderance of males who account for about three quarters of the casualties in several published studies may reflect gender disparities in access to economic opportunities unfair access to disposable family income and in exposure to road traffic injury risks as drivers, pedestrians and passengers.

Odero, Khayesi and Heda (2003), looked at road fatalities in Kenya, the latter of which has one of the highest road accident related morbidity and mortality in East Africa and is the third single highest cause of death, after Malaria and HIV.

The authors found that in each one of the administrative regions, the majority of fatalities due to motor vehicle crashes were males. in some regions followed by women, whereas in other by children

Francelina R, Hanifa (2003) found a similar pattern in Mozambique, with variable children and women coming second from region to region.

Looking at the available global data, overall, young adults (age 15-44years) account for most of the fatalities and injuries from road traffic crashes.

That this age group is the most economically active carries significant economic implications for the economies concerned

CHAPTER 3

STUDY AREA AND METHODOLOGY

3.1 Study Area

In 2002 alone, 27% of all non natural deaths in South Africa were transport related, out of which 76% were from the pedestrian category. As previously mentioned, this data only represents 40% of the recorded NIMSS data, leaving 60% of these un- natural deaths unexplored. In addition, while there is data for 2002, no data is available for the rest of the study period which is up to 2005. To date in South Africa, the Department of Transport as well as the Safety and Peace Promotion Research Unit, a South African Medical Research Council and University of South Africa Joint Initiative separately produce annual reports, that give an insight on the magnitude of transport related mortality and morbidity in general, and pedestrian mortality in particular.

The study will be conducted in Soweto (Figure 3.1), which is the largest apartheid era township in South Africa, located to the south west of Johannesburg, from where it derives its name (South West Townships). While the actual population of Soweto is difficult to quantify, the last census estimate put it at 1.5 million inhabitants (Statistics South Africa, 2001). Part of the difficulty in getting the actual population figures stems from the fact that most dwellings have one or more backroom dwellings, and especially in the last decade, informal settlements have mushroomed in areas that were previously empty of human habitation. The problem of population estimates is compounded by the number of 'silent inhabitants' in the form of illegal immigrants and a large number of relatives and friends from the extended family and social network. The illegal immigrants and the extended families flock to Soweto to access the ever diminishing job market and the relatively better social amenities in and around the Soweto area.

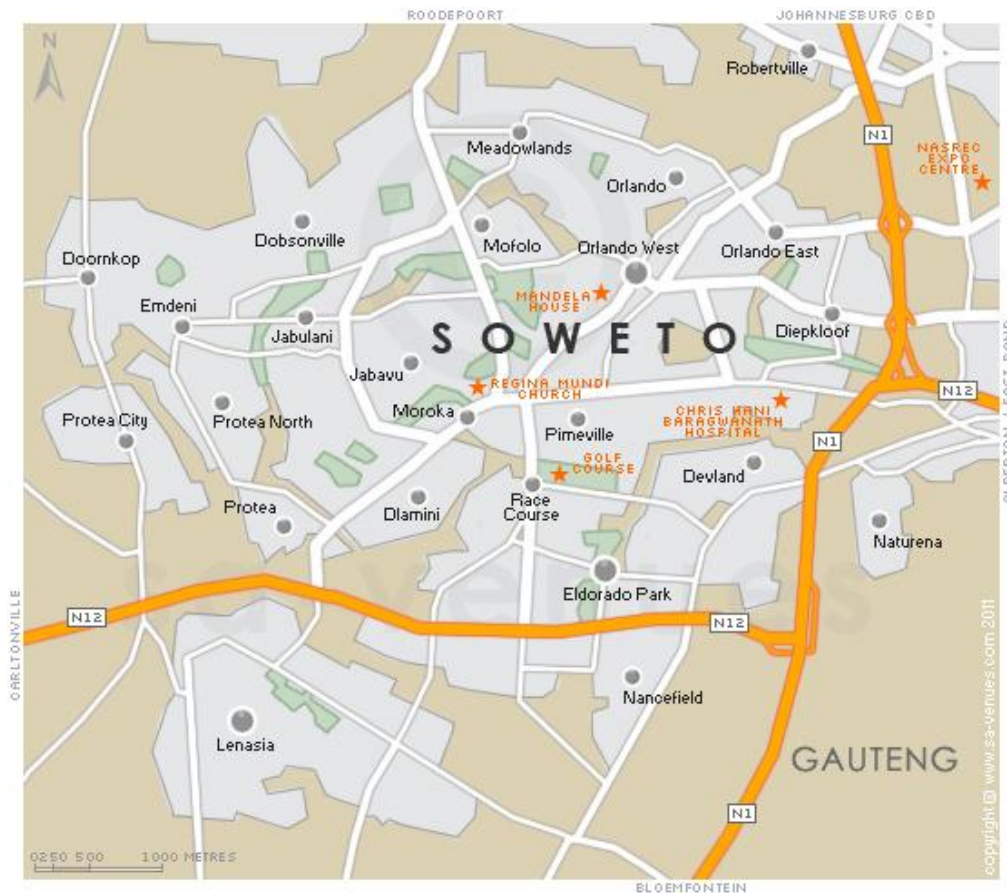


Figure 3.1: Map showing the location of Soweto (www.sa-venues.com/maps/atlas/gau_soweto.gif)

In 2002 alone, 27% of all non natural deaths in South Africa were transport related, out of which 76% were from the pedestrian category. To date in South Africa, the Department of Transport as well as the Safety and Peace Promotion Research Unit, a South African Medical Research Council and University of South Africa Joint Initiative separately produce annual reports, that give an insight on the magnitude of transport related mortality and morbidity in general, and pedestrian mortality in particular

3.2 Data and Materials

This is a Descriptive Cross Sectional Analysis of Mortality Data from an electronic database captured over the study period, the data of which is routinely captured on a standard National Injury Mortality Surveillance System (NIMSS) questionnaire (see annexure 2).

To assess key factors that influence the observed patterns, the following variables were chosen from NISS database and these are:

- Day and Time of death.
- Demographic characteristics of age, gender and population group.
- Systemic alcohol levels of the deceased pedestrian at the time of death.
- The place where the event occurred
- The participation of Emergency or Hospital services.

This data was obtained from the NIMSS database, with permission.

The study population is all deceased pedestrians that were admitted at the Diepkloof Medico-legal Laboratory for the purposes of a medico legal autopsy or post-mortem, irrespective of where the primary pedestrian event took place. Data from all 962 deceased pedestrian (see Table 1) was analysed. On cleaning the data further, only 857 fitted the Inclusion criteria for the purposes of the study.

3.2.1 The Data Inclusion Criteria (general):

All pedestrian motor vehicle transport deceased, who died following a pedestrian event in Soweto¹.

Inclusion criteria for assessment of the victims' blood for Blood alcohol Concentration were:-

- The victim had to be more than 12 years of age
- The death must have been immediate
- If death was delayed, the deceased must not have been resuscitated with intravenous fluids, including blood.

¹ Soweto as officially geographically demarcated was included in the study

3.2.2 The Exclusion Criteria (general)

All fatalities that resulted from pedestrian incidents outside Soweto as demarcated were excluded. It is important to note that the Diepkloof facility acts as a referral mortuary for medico- legal laboratory for Chris Hani Baragwanath Hospital, a government referral hospital, whose catchment area spans three provinces, as well as three private hospitals, (the Lenmed Clinic, Tshepo Temba Clinic, and Lesedi Clinic). Their catchment areas also go beyond Soweto. To add clarity to this statement, Diepkloof Mortuary is situated a stone throw away from the Chris Hani Baragwanath Hospital, the latter of which functions as a dedicated referral centre to a number of municipalities other than Johannesburg; Ekurhuleni in the East Rand and Sedibeng (in the Vaal triangle) as well a number of provinces other than Gauteng, such as the North West and Mpumalanga.

Exclusion criteria for assessment of the victims' blood for Blood alcohol Concentration were:-

- Victims whose age was 12 years or below
- Where the body was badly decomposed, no blood would be collected, as increased blood alcohol concentrations were expected, through the phenomenon of endogenous post mortem alcohol production
- If the deceased had died due to excessive blood loss or exsanguination
- Where the deceased had undergone emergency medical procedures such as resuscitation with fluids or blood, or Where the patient had survived for more than 24 hours after the incident

-

For the purposes of determining blood alcohol concentration, blood was collected from the femoral or brachial vein or artery into a sterile collection tube, and immediately transferred into a standard Blood Alcohol Concentration BAC Kit. This kit bottle contains a specific weight of Fluoride, the latter of which prevents endogenous post mortem alcohol production in human tissues and fluids such as blood and pleural fluid. Blood alcohol was then determined using standard gas chromatography, and an internal standard, and the results were expressed as grams per 100 millilitres

In terms of the existing statutory dispensation (The Births and Deaths Registration Act, Act No 51, and In compliance with the National Health Act No 61 of 2003 ó annexures 3 and 4), all deaths that are deemed "Un-natural" must be investigated through the performance of a medical-legal autopsy. This means that irrespective of whether the deceased was a primary Soweto victim of an un natural death such as a motor-vehicle accident, if the deceased was a referral from outside the primary catchment area for the purposes of this study, the body will be brought to Diepkloof Mortuary, where a post-mortem is then conducted. Where the primary cause of death was a motor vehicle accident, the victim data is captured under the NIMMS category motor vehicle accident, but if the primary event itself was outside the study area, this information is excluded, for the purposes of this study.

3.3 Data collection and Analysis

The Study is a secondary data analysis of an already existing electronic database. This data is routinely captured by the pathologist that performs each autopsy, as part of the work up of the case on a NIMSS questionnaire. This data is then captured into a computer database into a NIMSS spreadsheet. The data is transferred from the desktop by NIMSS staff. By cleaning and analyzing the data set, the annual report of The National Injury Mortality Surveillance System, "A Profile of Fatal Injuries in South Africa" is produced.

3.3.1 Data Preparation and Analysis

All the data that met the inclusion criteria from the original dataset was included and transferred from the Microsoft Spreadsheet to Stata 10 (Stata Corp, 2008, USA), where statistical analyses were carried out.

Continuous variables were summarized using means and standard deviations, while categorical variables were summarized using proportions. **Summary** data were presented in graphs and tables. Line graphs of proportions and **explanatory variables** were plotted for mortality patterns. **Chi-squared test** was used to assess for significant differences in proportions between categorical variables. **Correlation analysis** was conducted to assess the relationship between blood alcohol proportions and proportion of deaths. All **significance testing analysis** was done at an alpha level of 0.05. P values of less than 0.05 were considered statistically significant.

3.3.2 Definition of Variables

In this study, a death is described as unnatural, when it fulfils the criteria for such description as defined in terms of the Births and deaths Registration act, of 1992(Act No 51 of 1992 see annexure 3). This would include death from motor vehicle accidents which would be sudden, unexpected and or unexplained and in some cases where the cause of death is not apparent (The National Code of Guidelines for Forensic Pathology Practice in SA 2003)-annexure 4 pages 2-5.

1. Demographic information (Age, Sex, population group).

- Age ranges in years were classified as Children (0-12), Adolescents (13-17), Adults (18-49), and Elderly (50 and above).

2. Sex.

- This report uses sex rather than gender to distinguish between male and female deaths.

In general, the term sex is used to describe distinctive physiological and anatomical features related to being male or female. On the other hand, the term gender comprises different occupational, social, and physiological attributes that are variously attributed to being male or female. The latter concept depends on societal norms and is not internationally comparative.

3. Population group.

- The traditional South African population groupings of White, Asian, Black, Colored and Unknown are used in this report.

These traditional groupings have influenced and possibly continue to influence the availability and access to Services of each of the population groups. It will be interesting to see whether in post apartheid South Africa, there has been a change in patterns and trends that previously occurred along racial groupings. It is important to note that this study is conducted in a predominantly black area; therefore on reporting on other population groups are expected.

4. *Day of the week.*

- Sunday is the first day of the week

5. *Time of the day.*

- Time is described using the 24 hour clock, with mid-night described as 00 .00hours.

6. *Blood alcohol concentration (BAC)*

- BAC is defined and was determined as per attached Annexure1 from the Forensic Chemistry Laboratory of the National Department of Health.

3.4 Spatial Location of Pedestrian Facilities

In order to understand further the factors that could have had an effect on the pedestrian incident and the subsequent fatal outcome, the spatial location of the scene needed to be described. However, the current database does not in most instances give the exact location where victims of motor vehicle incidents occurred using GPS (Global Positioning Systems), but rather by street name, a road name or a policing zone.

A digital map created by the City of Johannesburg using GIS (Figure 3.2) highlights points that represent features such as houses, cities, road networks, and other physical objects. Most importantly it shows health care facilities, emergency or fire services and policing zones which are essential in the response to motor vehicle incidents. In the database used in this study, the most accurate spatial description was assessed to be the

policing zone, especially since Soweto is divided and well demarcated into policing and magisterial areas (Figure 3.2 see also in appendix). As a result, the default spatial locations used in the entire study are represented as Diepkloof, Meadowlands, Dobsonville, Jabulani, Naledi, Orlando, Moroka, Lenasia and Protea Glen Police stations. The latest digital map of Soweto, showing the above police stations or policing areas was used. Further the map presents addition infrastructure information such as the location of the main roads, shopping malls and schools.



Figure 3.2: Map of Soweto with infrastructure

This map assisted in the understanding of the relationships between service areas, roads, motor traffic and human population; how they might interact and how this possibly impacts on pedestrian mortality. This relationship has the potential of being exploited positively in designing road safety and pedestrian mortality prevention programs.

3.5 Limitations to the study

There were a few limitations associated with the study which included the source of the data analysed.

The NIMMS data is obviously limited to motor vehicle incidents that are reported and even for these there is an apparent lack of detailed demographic information as well as an imprecise scene description. No allowance is given for the description of the type of motor vehicle involved, or the exact circumstances of the victim, such as “*driver with seat belt*”, or “*pedestrian*” on the “*kerb side*” or pedestrian “*in the middle of the road*.” Lack of such specific and precise aggregated groupings therefore does not allow for the accurate identification of the road user, and the assessment of the extent of involvement of a specific type of road user.

The other potential source of data error in this dataset is that there is no consistency in the data capture, in the way they used or applied some definitions. The current NIMMS form is routinely completed by medical staff, who may have different interpretations and understanding of some of the data items to be captured. This is exacerbated by the delegation of the data capturing role to Administrative staff, whose understanding of the data items to be entered may differ from those of the intended user of the data.

The traffic violation aspect and its impact on pedestrian mortality was not investigated, mainly because of the nature of the available dataset. Analysis of this particular aspect could have been improved by the addition of specific data questions in the NIMSS data collection form, that address particular aspects from each road-user category view, especially after the incident investigation has been completed.

Alcohol as a factor was difficult to assess as the number of victims in which blood alcohol levels were measured were very small. The study also found that it was difficult to accurately determine the precise geographic or topographic details of the places where pedestrian victims of road traffic died or got injured, as such details were only vaguely recorded, and in some cases, simply not available in a usable or informative way. This challenge was further compounded by the fact that there was no specific allowance for GPS incident mapping on the current SAP 180 (South African Police Form 180), or the NIMSS data collection questionnaire that is currently in use.

It would be useful to have available data on traffic flows over the week to correct for this potentially important variable. There are some studies in literature where this particular aspect has been looked at. Odero et al(1977), Wong et al (1990), and Wu et al (1991), have shown that high speed, driver negligence, improper overtaking, disregarding of traffic lights, and lack of respect for other road users were some of the main causal factors.

Optimal visibility has been mentioned as an important factor in the prevention of motor vehicle accidents (Elvick 1996). The effects of sub-optimal visibility could not be assessed in this study, as the current data collection tools do not allow for visibility as a factor to be recorded and assessed. The inclusion of visibility conditions on a revised SAP 180 and NIMSS data collection forms would make this important factor easier to document and assess.

CHAPTER 4

RESULTS

4.0 Introduction

This chapter presents the results of this study which aimed to determine the magnitude and the pattern of motor vehicle related pedestrian mortality, and to assess the key factors that influence these patterns.

The chapter is presented in three parts:

1. The magnitude of motor vehicle related Pedestrian Mortality and Data Quality.
2. The seasonal pattern of motor vehicle related Pedestrian Mortality
3. Key factors that influence the pattern of motor vehicle related Pedestrian Mortality

4.1 Part 1: The magnitude of motor vehicle related Pedestrian Mortality in Soweto

Over the study period from 2001 to 2005, there were a total of 8964 un-natural deaths that were examined at Diepkloof Medico-legal laboratory, out of which pedestrians accounted for 50% of all vehicle related mortality. On the other hand, pedestrian deaths accounted for only 11% of all un-natural deaths.

This clearly indicates that although motor vehicle related mortality accounts for a small percentage of all un-natural deaths, pedestrians comprised the majority of motor vehicle related un-natural mortality, and are as such, the most vulnerable road users.

Year	2001 N (%)	2002 N (%)	2003 N (%)	2004 N (%)	2005 N (%)	Total (over the five year period)
All un-natural mortality	2018	1803	1769	1641	1733	8964
Motor vehicle mortality to all un natural mortality	21%	18%	21%	23%	26%	22%
n=All motor vehicle related mortality	426	328	363	376	457	1950
All pedestrian mortality	207	168	176	217	195	963
Percentage of pedestrian deaths	49%	52%	48%	58%	43%	50%
Pedestrian mortality to All un natural mortality	10%	9%	10%	13%	11%	11%

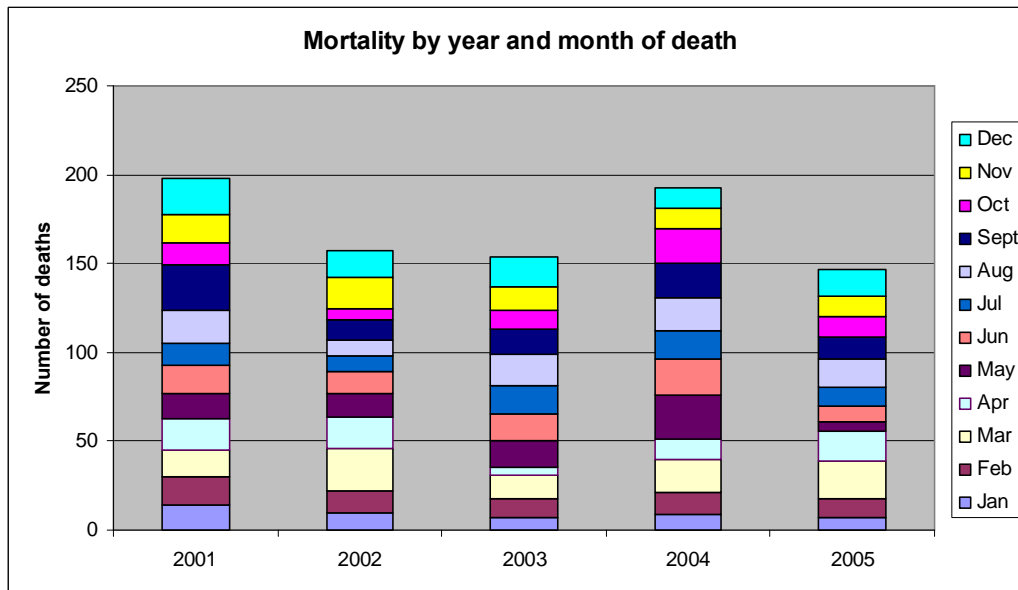
Table 4.1: Proportion of Pedestrian mortality to all un natural mortality- a Five year profile.

Source: NIMMS, 2007.

4.2 Part 2: The seasonal pattern of motor vehicle related Pedestrian Mortality

4. 2.1. Mortality pattern by year and month of death

There seems to be a detectable pattern in pedestrian mortality by year. The relationship appears to be undulating for the different months. Pedestrian mortality decreased consistently from 2001 until 2003, to rise sharply again in 2004, then dipping again to below all the pre 2004 levels (figure 4.1). While January generally has the lowest figure, other month such as April 2003 and October 2002 and May 2005 also had low figures., Therefore there is no discernable pattern in mortality by month. The monthly variation in mortality by year showed no significance (p-value = 0.161).



Figures 4.1: Yearly and monthly variation in annual and monthly pedestrian mortality for Soweto

Looking at mortality in May in 2004 as an example, there is a marked reduction in mortality in the same month in the following year 2005. The possible explanation for this trend could be attributed to intense road awareness campaigns by law enforcement, based on the previous records.

4.2.2. Mortality pattern by the day of the week of death

Further analyses were carried out to assess if day of the week and time of the day played an important role in mortality.

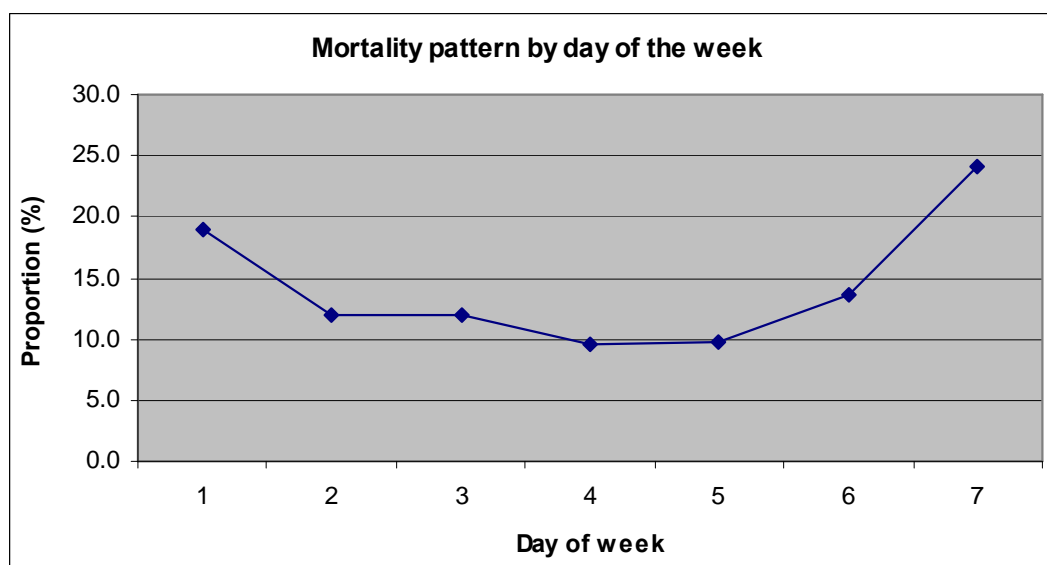


Figure 4.2: Pedestrian mortality by day of the week (day 1 of the week is a Sunday)

The results indicate that mortality increased deaths were observed around from late Fridays and throughout the weekends.

This pattern could be related to the different activities that the various age groups engage in during the course of the day. Survivability of a motor crash has also been linked to the promptness, quality and access of the victim to health care. This particular aspect is further discussed elsewhere (Participation of Emergency Medical Services). Unfortunately though, the available database does not allow this particular line of enquiry to be pursued accurately and specifically.

4.2.3 Mortality pattern by time of death

Time was categorized into four groups of six hours. An obvious mortality pattern by time of death was discernible. The number of pedestrian death increases gradually as the day goes by from morning to midnight. About half pedestrian deaths takes place between 6pm and midnight.

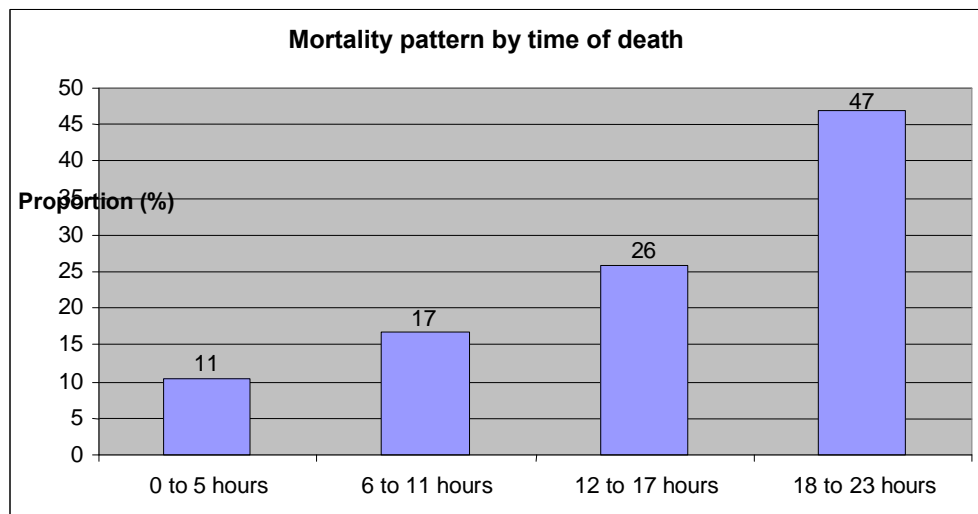


Figure 4.3: Mortality proportions by time of death

The observed increased death from 18 to 23 hours was statistically significant ($p=0.003$) for all days of the week (Fig 4.3).

Table 4.2: Mortality by time of the day and day of the week

	Time (hours)				
	0 ó 5	6 ó 11	12 ó 17	18 - 23	Total
1 SUNDAY	18 % [22]	11% [13]	18% [21]	53% [63]	119 (100%)
2 MONDAY	9% [6]	17% [12]	30% [21]	44% [30]	69100%)
3 TUESDAY	5% [4]	26% [19]	37% [27]	32% [23]	73100%)
4 WEDNSDAY	8% [5]	15% [9]	35% [22]	42% [26]	62100%)
5 THURSDAY	4% [3]	27% [18]	29% [20]	40% [27]	68100%)
6 FRIDAY	14% [13]	14% [13]	21% [19]	51% [47]	92100%)
7 SATURDAY	9% [16]	15% [26]	22% [38]	53% [90]	170100%)
	[69]	[110]	[168]	[306]	653

Pearson chi 2(18) = 43.0078 Pr = 0.001

It becomes apparent that, irrespective of the day of the week, the majority of pedestrian deaths occur between 18; 00 and 23:00 hours, these deaths taking place over weekend days (Friday to Sunday).

4.3 Part 3 Key factors that influence the pattern of motor vehicle related pedestrian mortality

4.3.1 Part 3. 1 Mortality by population group

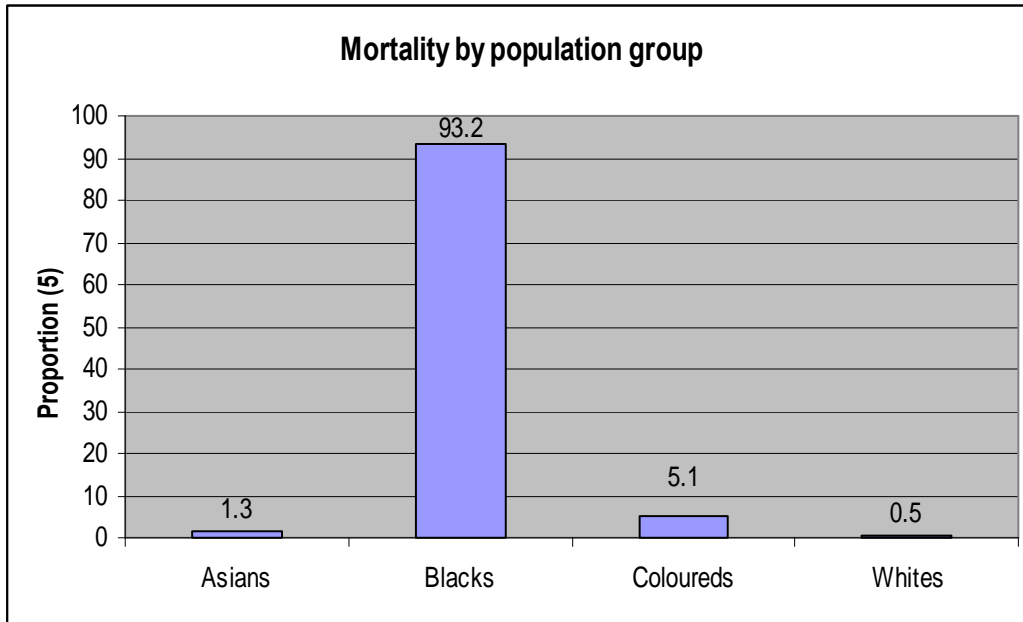


Figure 4.4: Mortality by Population group (a five year profile)

Most (93%) of the deaths occurred amongst Blacks followed by Coloureds. That there was only one white fatality is hardly surprising, as Soweto remains a predominantly black Township (Fig 4.5).

4.3.3 Mortality by Gender Group

There were more male deaths than female deaths (figure 4.6) during the study period, across all population groups, with the majority of the male victims being from the black population group (Figure 4.7). There were hardly any white female pedestrian deaths over the study period.

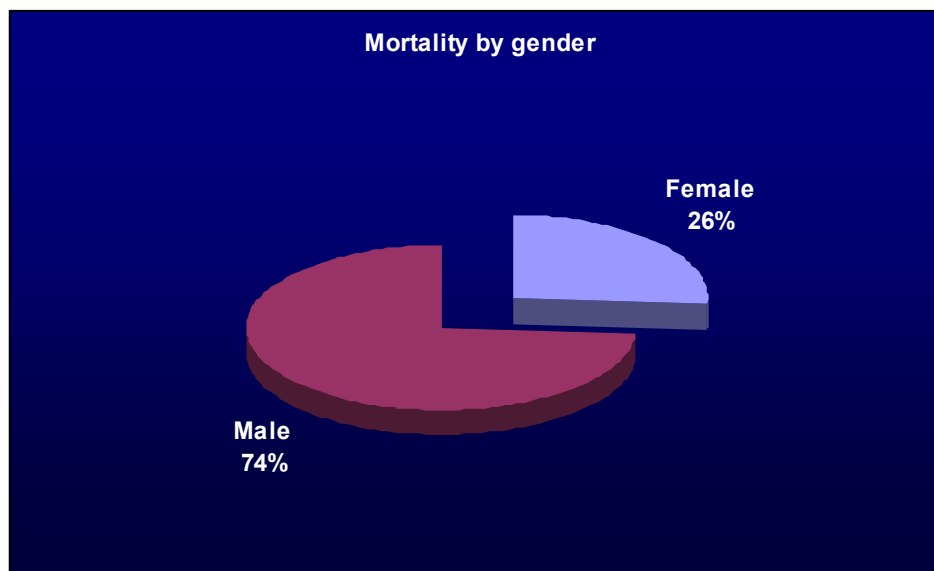


Figure 4.5: Mortality by Gender (a five year profile).

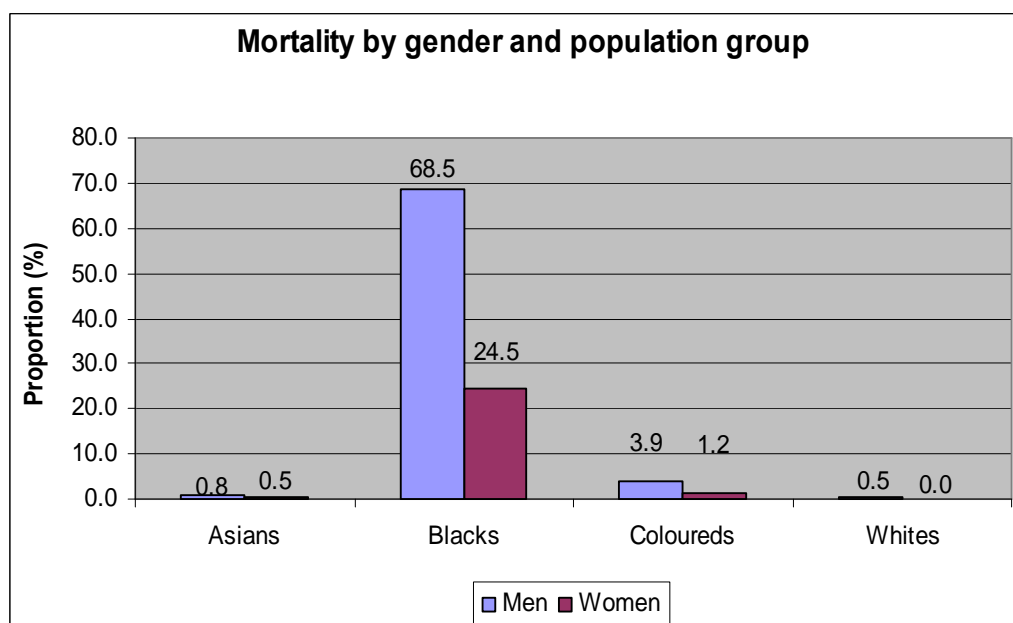


Figure.4.6: Mortality by Population and Gender groups (a five year profile)

4.3.4 Mortality by Age

Age data was available for 566 participants, and was categorized as children, adolescent, adults (reproductive age and workforce) and elderly.

The mean age of cases was 32.7 years with a standard deviation of 20.5 and a range of 0 ó 89 years. Most pedestrian deaths occurred amongst adults (5.1%) (18 ó 49 years). This was followed by children (24.2%) (0-12years), while the smallest proportion of deaths was observed in the adolescent age group (2.7%) (13-17years).

Table 4.3: Mortality by age group

Age group	Number	Proportion (%)
Children (0 ó 12 years)	137	24.2
Adolescents (13 ó 17 years)	14	2.47
Adults (18 ó 49 years)	295	52.1
Elderly (50 years and above)	120	21.2

4.3.5 Mortality by gender, population group, time of death and age group

This may not be surprising given that Soweto is predominantly a black township, and it is argued that had the study been conducted in a predominantly white, coloured or Indian location, a similar pattern of predominantly male deaths would be demonstrated.

Table 4.4: Mortality by gender and time of the day

	Time of the day (hours)				
	0 - 5	6 ó 11	12 ó 17	18 - 23	Total
Female	12% [20]	16% [27]	34% [57]	38% [63]	167
Male	10% [48]	17% [78]	23% [109]	50.% [235]	470
All sex	22% [68]	33% [105]	57% [166]	88% [298]	637

The analysis illustrated that while similar proportions of men and women died between 0h00 and 11h00, more women died in day time between 12h00 and 17h00 while more men died late evening and during night between 18h00 and 23h00 .These sex difference

were statistically significant ($p = 0.019$). The analysis of gender by day of death showed no gender differences (Pearson $\chi^2(6) = 4.9806$; $p = 0.546$).

Age group by time of death reveal a relationship between age group and time of death. While most adults and the elderly died late in the evening (18 ó 23 hours), most children died between 12 and 17 hours while most adolescent died between 6 and 11 hours ($p=0.001$).

Table 4.5: Proportion of pedestrian death by Age group and Time of the Day

	Time of the day (hours)				Total
	0 ó 5	6 ó 11	12 ó 17	18 - 23	
Children (0 ó 12 years)	9% [10]	18%[20]	40%[44]	32%[35]	109
Adolescents (13 ó 17 years)	14% [1]	38%[3]	25%[2]	25%[2]	8
Adults (18 ó 49 years)	13%[27]	12%[26]	22%[45]	53%[111]	209
Elderly (50 years and above)	7%[4]	27%[23]	21%[19]	47%[42]	90
All deaths	[44]	[72]	[110]	[190]	416

According to this study, most adult and elderly pedestrians were likely to die between 18 and 23 hours (53% and 42% respectively), The majority of adolescent deaths occurred between 6 and 11 hours (38%), whereas on the hand, the majority of deaths in children occurred between 12 and 17 hours (40%).

4.4 Blood Alcohol levels and Mortality

4.4.1 Blood alcohol levels by age group, population group and time of death

In this study, Systemic alcohol level at the time of death was available for 352 cases. The current legislation pertaining to alcohol and road use is mainly with regards to drivers, but it gives a reasonable idea on what acceptable blood alcohol levels should be amongst pedestrians, the road user category in this study.

According to the National Road Traffic Act (NRTA), Act 93 of 1996 as amended, the following are the Statutory Blood and Breath Alcohol Content (BAC) limits:

- Concentration of alcohol in blood: 0,05grams per 100milliliters (all drivers)
- 0,02grams per 100 millilitres (professional drivers)
- Breath alcohol content: 0, 024 milligrams per 100milliliters (all drivers),
- 0,010 grams per 100milliliters (professional drivers)

The mean blood alcohol level for all cases was 13.9 grams per 100 millilitres with a standard deviation of 15.4 and a range of 0 to 96.

Table 4.6: Blood alcohol concentration and age group

Age-group	Mean (standard deviation) blood alcohol concentration (gm per 100 ml)	Median (interquartile range) Blood alcohol concentration (gm %)
Children: 0 ó 12 years (n = 3)	0 (0)	0 (0)
Adolescents: 13 ó 17 years (n = 3)	11.7 (15.9)	0 (0 ó 35)
Adults: 18 ó 49 years (n = 126)	15.6 (20.2)	16 (0 ó 29)
Elderly: 50 years and above (n = 48)	8.9 (16.3)	0 (0 ó 18)

The study found that, for those deceased where blood was collected and assessed for alcohol content, pedestrian fatalities in the adult age group (18 -49years) were found to have the highest mean blood alcohol content (15.6mg/1000ml). On the other hand, the lowest mean blood alcohol content (8.9mg/1000ml) was found in the elderly age group (50 years and above). Blood alcohol concentration was not assessed in children aged 12years and below, as they did not fulfil the inclusion criteria for mandatory blood alcohol testing.

Table 4.6 further highlights the results of BAC assays performed on the pedestrian fatalities that fulfilled the inclusion criteria for BAC assays. As expected, alcohol level was higher for adults than for other groups. However, the differences were not statistically significant due to the small numbers in some cells. BAC is not routinely assayed in children, (age range 0-12 years).

Table 4.7: Blood Alcohol concentration and racial group

Population group	Mean (standard deviation) blood alcohol concentration	Median (interquartile range) blood alcohol concentration
Asian (n = 4)	7 (14.0)	0 (0 - 14)
Black (n = 319)	14.2 (15.6)	12 (0 ó 25)
Colored (n = 25)	13.2 (13.4)	7 (0 ó 26)
Whites (n = 1)	0	0

Further, the study also revealed that, from the available sample size (n= 349) pedestrian fatalities, that fulfilled the inclusion criteria for mandatory blood alcohol testing, the highest mean blood alcohol concentration was found in the black population group (n=319) (91%), followed by the coloured population group (n=25) (7%).

Table 4.8: Blood alcohol concentration and time of death

Time of death	Mean (standard deviation) blood alcohol level	Median (interquartile range) blood alcohol level
0 ó 5	13.1 (11.7)	13 (0 ó 22)
6 ó 11	5.8 (9.9)	0 (0 ó 9)
12 ó 17	9.2 (13.5)	0 (0 ó 21)
18 ó 23	19.1 (17.1)	20 (0 ó 30)

When blood alcohol results were assessed by the time of the day at which the pedestrian died, the highest mean blood alcohol concentration was found in those victims that died in the evening and at night (18-23hours) [19.1mg/1000ml], closely followed by those victims that died in the early morning (0-5 hours) [13.1mg%]. By contrast, the lowest mean blood alcohol concentration was found in those victims that died in the late morning (6-11hours) [5.8mg/1000ml].

4.4.2 Blood Alcohol Concentrations and Sex

Blood alcohol level was significantly higher for males than for females. The blood alcohol level for male was 15.3 with a standard deviation of 15.1 while the values were 9.6 and 15.1 respectively. The p-value (0.003) shows that this difference was statistically significant.

4.4.3 Blood alcohol level and time and day of death

4.4.3.1 Time of death

Analysis of blood alcohol levels by time of death showed that blood alcohol level was significantly higher for deaths which occurred between 18 and 23 hours. This was followed by deaths that occurred in the early hours of the morning (p-value < 0.001).

Table 4.9: Blood alcohol concentration and time of death

Time of death	Mean (standard deviation) blood alcohol level	Median (range) blood alcohol level
0 ó 5	13.1 (11.7)	13 (0 ó 22)
6 ó 11	5.8 (9.9)	0 (0 ó 9)
12 ó 17	9.2 (13.5)	0 (0 ó 21)
18 ó 23	19.1 (17.1)	20 (0 ó 30)

4.4.3.2 Correlation between blood alcohol level and day of death due to pedestrian motor accidents.

Table 4.10: Blood Alcohol levels by Day of the Week when death occurred

Day of death	Mean blood alcohol level (gm/100ml)
Sunday	16.5
Monday	9.2
Tuesday	15.4
Wednesday	5.9
Thursday	3.7
Friday	13.3
Saturday	17.7

There was also an obvious pattern in the blood alcohol level by day of death and the observed differences were statistically significant ($p < 0.001$). Alcohol levels were highest for the days around the weekend and similar trends were noted for deaths observed by day of death. The linear correlation between blood alcohol level and proportion of deaths by day of death was statistically significant with a coefficient of 0.8 and a p-value of 0.032. This means that for every unit increase in mean alcohol level, there is about 1 percentage increase in deaths.

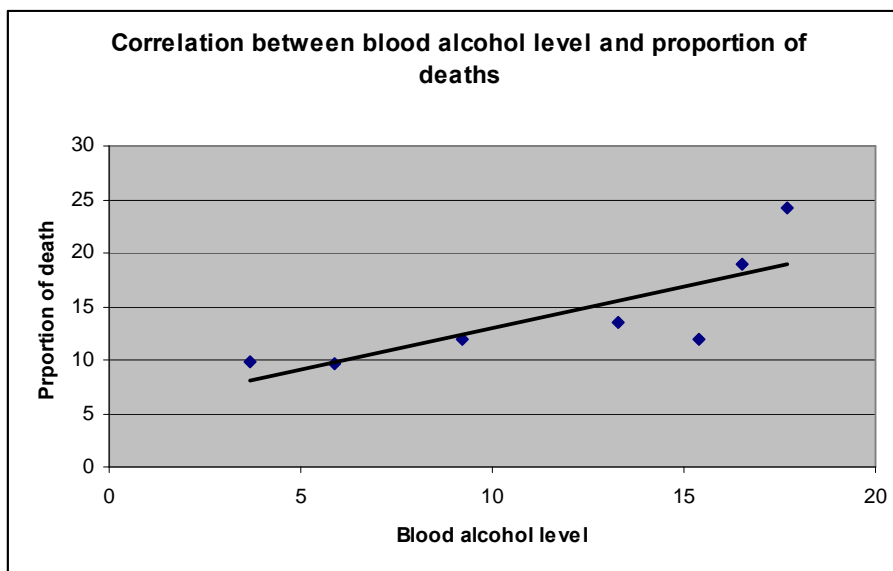


Figure 4.7: Blood alcohol concentration and proportion of death.

4.5 Medical treatment received: Emergency or Hospital

In this study, the majority (58%) of all incidents prior to death of deceased did not have any record to suggest that they had received any kind of kind of medical care. Only 4% received emergency care (Figure 4.8).

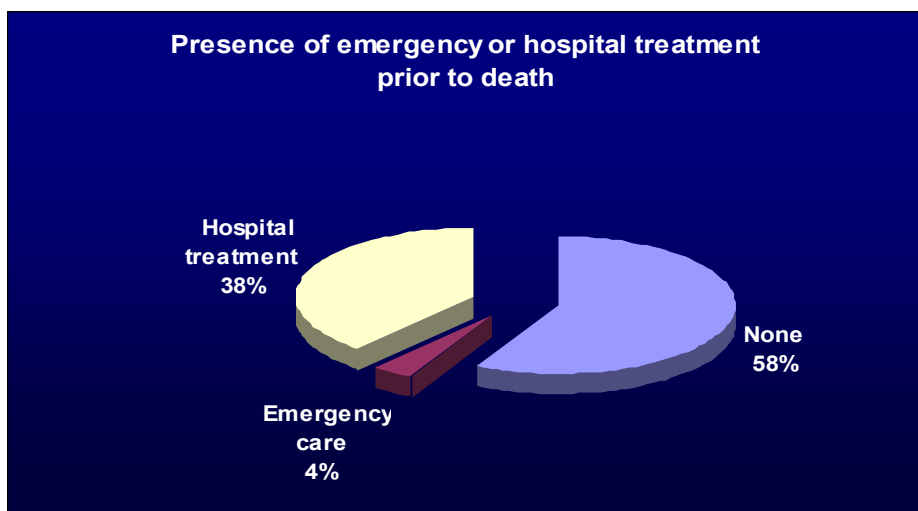


Figure 4.8: Access to Emergency Health Services (2001-2005)

The available data set and the nature in which it was collected, does not allow one to gather accurate data about : how many victims were certified dead at the scene, how many needed road side assistance, or how many did receive road side assistance before they died. It would therefore be too judgmental to make any conclusions with regards to the participation of Soweto's Emergency medical services, bearing in mind that the time of death for most victims occur at a time when the only Emergency staff are on duty are relief staff and not the usual day time full compliment. The days of the week when most of these fatalities occur (week-end evenings and early mornings) further creates further compromise on the efficiency of the skeleton relief emergency staff. Another exacerbating factor is poor lighting which increases the chances of victims not being found on time. This delays further, delays access to medical care. Primary health care facilities that cater for the some of the injured during the weekday are closed at night and on weekends, when most of the accidents occur.

That notwithstanding and whereas the available data from this study suggests a shocking story that the majority of traffic incident victims seem not to have received any form of medical care, there are studies in literature that show that traffic related injury still accounts for a very high proportion of trauma admissions, suggesting that perhaps, overall, road traffic victims constitute a significant proportion of all call outs for emergency medical assistance.

4.6 Police stations nearest to scene of incident

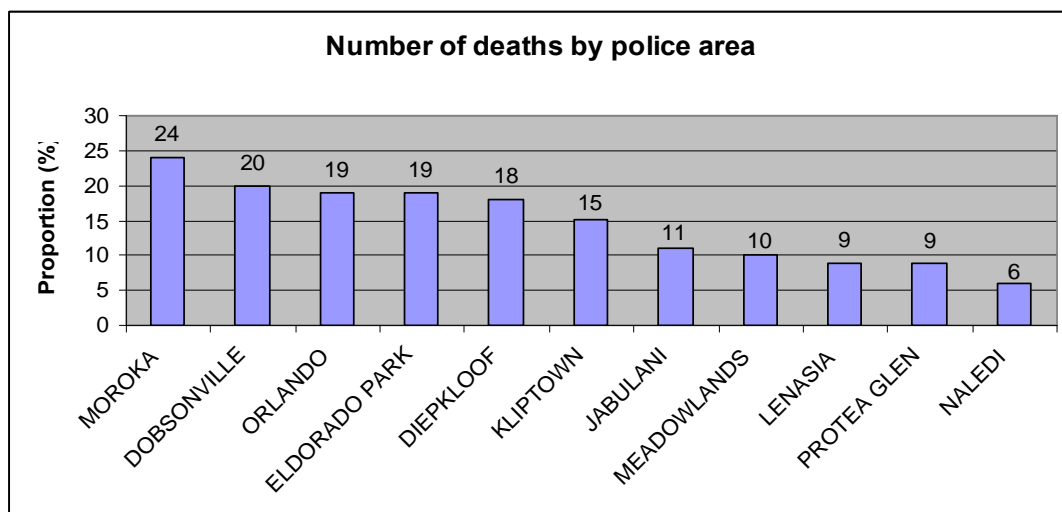


Figure 4.9: Reported Pedestrian Deaths per Policing area, Soweto 2001-2005

Data on the police station nearest to site of incident was available for some participants. Figure 4.9 shows the distribution of the data. Moroka police station recorded the highest number of deaths and Naledi police station, the lowest.

As previously mentioned, there are eleven specific areas of Orlando, Diepkloof, Moroka, Kliptown, Naledi, Meadowlands, Dobsonville, Eldorado Park, Jabulani, Lenasia, and Protea Glen within the greater Soweto (Figure 3.1). The Focal point of each of these eleven -policingø zones is police stations at which all traffic incidents are reported for each of the Policing zone. For example, a traffic incident that takes place in Orlando could be reported at Protea Glen Police station, but for the purposes of investigation and prosecution, the matter must subsequently be transferred to Orlando police station, as the principal policing and enforcement centre.

CHAPTER 5

DISCUSSION

5.1 Discussion

5.1.1 Magnitude of Pedestrian Mortality

Sukhai and van Niekerk (2002) in their chapter on transport related deaths in the annual report 'A profile of Fatal Injuries in South Africa' published in 2002, pedestrians accounted for the highest percentage (37.4%) of all transport related deaths. This however must be taken in the context of the report itself, where the denominator, transport related deaths included all transport user categories such as drivers, passengers, pedestrians, cyclists, motorcyclists and railway casualties. Aviation casualties were excluded from the denominator as their numbers were too small.

The trend in terms of magnitude of pedestrian mortality in the Annual report supports the findings from the Soweto study, highlighting pedestrians as the most at risk compared to other road users. The magnitude from both the study and the Annual report is numerically similar. Similar findings have been reported by other researchers such as Nantulya and Reich (2002, and 2003), Mohan and Tiwari (1998), Francelina and Hanifa (2003) among others. These studies cite a number of common factors such as risky behaviour of pedestrians, ignoring road rules, inadequate or inappropriate barriers that are meant to separate motorists from pedestrians, and the encroachment of pedestrians on the road to promote their own economic activity. Other factors mentioned are bad driving habits of motorists and poor vehicle and road maintenance resulting in inadequate driver control of their vehicles. Nantulya et al and Muli et al (2001) mention that there are social determinants of road traffic accidents such as income type of economic activity and access to social amenities. Where there is inequitable distribution of services such as the siting of amenities on one side of the free way while the dwellings are on the opposite side appears to result in increased risk for pedestrians when they attempt to access these amenities. The people in these dwellings are forced to

engage in risky pedestrian behaviour of trying to cross the road to access amenities, or to go to work. The findings from the Soweto study appear no different.

The results of this study have shown that mortality was related to day of the week with increased deaths observed around weekend days, in particular late Fridays and Saturdays. It also highlighted that while similar proportions of men and women died between 0h00 and 11h00, more women died in the day between 12h00 and 17h00. More men died late evening and during night between 18h00 and 23h00. A number of reasons have been cited as being major contributors to more deaths at these times and on those weekend days. Similar findings have been shown by Odera, Garner and Zwi (1997), in a review of 19 studies, they found a greater incidence of traffic injury during weekends, between 0600h on Friday and Monday 0600h, compared to mid week days.

Weekend days are commonly associated with an increased partaking of alcohol and other mood altering substances, and at a time when Emergency medical services are operating using skeleton weekend shift staff, as are the Police services and Trauma centres in both the public and private health sector. In fact, in Soweto, most Municipal clinics are actually closed over weekends. All these factors compromise the efficiency with which victims of traffic accidents can be assisted timeously. Less visible Police presence which on other days acts as deterrent, means motorists and pedestrians alike are more likely to engage in reckless road habits of both drivers and pedestrians. The same observations have been made by workers in other countries, citing the same factors as being contributing factors to the vulnerability of pedestrian road users on weekends.

When Emergency Medical Services are most stretched this factor translates into the overall delay in accessing care which in turn decreases the chances of a road accident victim being assisted in time and this factor impacts negatively overall on a victim's survivability. Of the total weekly figure, they found an average of 52% of traffic injuries occurring during weekends (range 36-74%), which was significantly higher than the expected proportion of 43% over a three day period, had the frequency been evenly distributed throughout the week. This high incidence, in excess of the expected average, suggests the effect of variations in traffic density and the influence of additional exposure risk factors including alcohol and possibly other intoxicating agents.

5.1.2 Key factors

5.1.2.1 Demographic Profiles of Pedestrian Mortality

Age

The annual report found that pedestrian mortality peaked at 30 ó 34 year old age group, and among children 1 ó 14 years, with the 5 ó 9 age groups at most risk. 56% of all child transport related deaths were pedestrian. Passenger deaths were almost equally high in all age groups from 20-34years. Amongst the children, the 5-9 year age group was most at risk.

In this Soweto study, more deaths occurred in the **adult age** group (18-49years), followed by **children** (0-12years). The findings from this study mirror those that were observed at both national and regional level, these observations coming from countries like Mozambique, Kenya and Ghana. The contribution of adults to the national economy of any country cannot be over emphasized and prevention of any adult deaths should be prioritized by all those countries keen on achieving and sustaining a viable economy. Adults in active economic life are major contributors of tax and make other significant contributions to social welfare schemes like pension funds, from where the younger and older members of society derive their social benefits. But are there underlying age related factors that make adults in particular more vulnerable than other age groups? Adults are at the peak economic output and their engagement in the various economic activities exposes them to heightened risks on the road, as they go about working by the road side to make a living, crossing the road to deliver goods or services to the opposite side. Their enhanced economic activity probably gives them access to extra income, which in turn allows them to engage in risky personal behaviour, such as acquiring substances, goods and services such as alcohol, that overall, increases their differential risk to harm, injury, and possibly, death.

Given the vital socio-economic importance of this age group, more studies need to be conducted to understand the root cause of its vulnerability, and specific intervention programs and preventative measures need to be put in place. Several published studies reviewed by Odera, Gardner Zwi (1997) showed that this population group accounted for 48-78% of all fatalities, and although there were overlaps in age groupings used by

various researchers, the results clearly indicated an excess representation of adolescents and young adults. It would be interesting to analyze data sets on age distribution of those actually exposed to the risk of being involved in traffic accidents. Patton, Coffey, Sawyer, Haller, Krishna (2009) found that up to 70% of the total years lost to traffic injuries were accounted for by this age group. This age group is also in the prime years of economic productivity, magnifying the economic impact of the burden.

This study found that the second most vulnerable pedestrian age group was children. But in order to understand this pattern one needs to ask the questions: Why do children cross the road and what is it in children that make them vulnerable road users? In general, vulnerability of children pedestrians has been associated with a number of factors, some of which have been cited as; the less than optimal physical and cognitive development and maturity, with consequential physical inability to get out of harm's way in time, the inability to perceive and correctly predict the level of risk, lack of appropriate life skills, poor supervision, and undetected and therefore uncorrected physical and mental defects that impair sensory and physical perception of potential harm. In the absence of dedicated spaces for leisure, they resort to playing on townships roads and pavements. Some children are also actively involved in road side commercial activity, such as vending sweets, frozen beverages, cigarettes and newspapers, either as sole bread winners of their families, or to supplement the family income. This activity exposes them to risk from injury from a number of potential hazards, including motor vehicle traffic. The insensitivity of motorists to children, lack of courtesy and respect for children in general only compound their overall vulnerability as road users.

Sex

The annual report found that there were 3.3 males for every female transport related death with the highest male to female ratio among cyclists (16:3). Among motor vehicle related pedestrian deaths alone, the highest male to female ratio was with the drivers, (ratio 8:6). Female passengers accounted for the highest percentage of all transport related deaths. Driver deaths accounted for the highest percentage of deaths amongst males. This detailed analysis was not performed in the Soweto study. Nevertheless, the annual report showed that three out of every four pedestrian fatalities were male (3:1).

According to the 1998 WHO database, males were more likely to be injured or killed in road crashes, estimated at 28.8 per 100 000 population, which was almost three times the rate for females, the latter estimated at 10.8 per 100 000 population.

Other researchers such as Nantulya et al (2001, 2002), Francelina et al (2003) Khayesi et al (1997) and Downing et al (1991) have postulated a mix of cultural, social, economic factors that explain why males appear to be the more vulnerable pedestrian road users. Male behaviour and social habits such as partaking in alcohol and mood altering substances as part of normal recreational activities has also been cited. Differences in attitudes by males and females while participating in road side commercial activities could also be a factor, as males tend to be more aggressive. In Soweto, there are more **male** than **female** deaths, across all population groups, with the male to female fatality ratio being 2.8:1 in blacks, while in coloureds the male to female ratio was 3:1. This is in-keeping with the findings of the annual report as well as data from World Health Organization (WHO) and from countries like Kenya and Ghana.

Day Time and Seasonal Trends

The annual report showed that high percentages of pedestrian deaths were recorded in March, June October and November, with the highest recorded for the winter month of July. With reference to time and day, all transport deaths peaked between 17h00 to 22h00, with a steady increase from Friday, peaking again on Saturday. The decrease is noted towards Sunday. This was attributed to the social activities that take place over the weekend often involving partaking of alcohol, and involving other pleasurable but often risky activities. With respect to day of the week, the Soweto study found a similar pattern of pedestrian deaths being highest over the weekend, starting on Friday, peaking on Saturday and dipping on Sunday.

In the Soweto study, while similar proportions of men and women died between 00h00 and 11h00, more women died in the day between 12h00 and 17h00 whereas more men died late evening and during night between 18h00 and 23h00. There are similarities between the findings of the Annual Report and the Soweto study Activities such as taking or escorting children to and from school, performing house chores such as cleaning and preparing meals for the family, are predominantly and traditionally carried out by the female sex. These activities perhaps impart a certain measure of safety, probably because their inherent nature appear to keep the females away from places that

would otherwise expose them to motor vehicle related risk. On the other hand, the males leave very early for work and come late in the evening, or sometimes pass by the local pub to socialize. Alternatively, they could come back home in the evening to take positions by the road side to engage in commercial activity that was manned by their female partners during the day. This perhaps increases their level of exposure to motor vehicle related risk. This is an area that needs to be explored through specific and targeted studies.

There could be underlying socio-cultural factors that underline this sex and population group specific mortality pattern such as sex specific behavioural patterns and underlying socio-economic circumstances that render black and coloured males more vulnerable to death from injury in general.

There was no specific month of the year that could be consistently associated with a high pedestrian death incident. However, there is a consistent pattern over the years from 2001 to 2005, where for instance in 2001, the highest pedestrian mortality was recorded in August, but in August 2002 the second least mortality was recorded. It would appear that the month of any year in which high pedestrian mortality would be recorded, was routinely followed possibly by excessive vigilance the same month of the following year. No specific reason could be found for the drop in pedestrian mortality that was observed in 2005.

Race or Population Group

The Annual report showed that blacks and coloureds accounted for the highest number of pedestrians deaths. In contrast, whites accounted for the highest transport related deaths for drivers. Amongst Asians, the percentage of drivers and passengers were equally distributed. This may in part be explained by the differences in income, where the white population group can afford to purchase motor vehicles, even as teenagers and they have access to their parents vehicles. Patton et al (2009) and Venick et al (1972) had similar findings, in their assessment of patterns of motor vehicle crashes along racial lines in their respective regions. In the Soweto study, 93% of deaths occurred in blacks, whereas in coloureds, pedestrians accounted for 5%.

These patterns are in a way influenced by the socio-economic background and activities of these population groups, as well as by the spatial location of the Soweto, which is a predominantly black township. One could also argue that in a predominantly sub-urban white settlement, if one was to examine Transport related deaths by user category, pedestrians and cyclist deaths could account for the highest fatalities, in conformity with the sporting and leisure activities that mirror their socio-economic means and status.

5.1.2.2 Blood Alcohol Concentration

Blood alcohol concentrations were available for 34.6% of all the transport related deaths and for those tested for blood alcohol concentration blood alcohol concentration was elevated in 51.9%. Of the positive cases, 91.1% had levels of 0.05g/100ml

The study found that pedestrian fatalities in the adult age group (18 -49years) were found to have the highest mean blood alcohol content as compared to the elderly age group. The highest mean blood alcohol concentration was found in those victims that died in the evening and at night closely followed by those victims that died in the early morning, in contrast those that died in the late morning, in whom alcohol levels were the lowest. Blood alcohol levels were also found to be significantly higher in males. It also emerged from this study, the highest mean blood alcohol concentration was found in the Black population group followed by the Coloured population group. No alcohol could be detected in the single fatality from the White population group. These findings are however not considered to be statistically significant, as the sample size is considered too small. These findings do point to an underlying mix of age, time sex and racial factors, which predispose particular pedestrians to a higher risk of injury and death on the road.

Understanding this mix and how it impacts on vulnerability could be a key to prevention. A review of literature on the subject also supports the view that there is a strong association between alcohol intoxication and pedestrian accidents (Baker, O'Neil and Karf; 1984). Irwin, Patterson and Rutherford, have reviewed case controlled studies and found that an intoxicated pedestrian was three to four times more likely to be struck by an automobile than their non intoxicated counterpart, and according to Honkaken,

Ertama, and Kuosmanen (1976), the risk of a pedestrian being struck by a motor vehicle increases significantly for blood alcohol concentrations of more than 200mg/dL. Waller (1972) on the other hand has shown that pedestrians with a blood alcohol concentration of 100mg /dL were usually accountable for their accidents, while adult pedestrians who have not been drinking were more often the innocent victims of accidents initiated by motorists. In their study on the effect of alcohol consumption on the outcome of pedestrian victims, Jehle and Cottingham (1988) conclude that pedestrian victims were commonly intoxicated, and had an increased frequency of and spinal injuries, a factor that may account for their higher morbidity and mortality rate. Reviews of evidence regarding interventions to reduce alcohol impaired driving have been examined by Shults, E. et al (2001) and suggestions as to how they can be integrated in other safe road users interventions have been suggested.

5.2. Interventions to reduce pedestrian mortality in Soweto

It becomes clear that designing interventions aimed at reducing pedestrian mortality in Soweto must address vulnerability of pedestrian according to age, road user category, population group, day time seasonal trends and location, the role of alcohol and the part played by Emergency medical services.

5.2.1 Age

Children and adults deserve special attention, as this study shows clearly that children in certain age groups, and adults in specific age categories appear to be the most vulnerable. School education programmes, regular primary health care based screening of possible ocular, physical and aural impairments, scholar patrols, traffic calming devices around schools and other areas frequented by children, or areas with high child population need to be given special attention. Reflector arm bands for children and reflector jackets for adults have been suggested as a possible age specific intervention and success of this specific intervention has been reported in Britain, the United States and Malaysia.

5.2.2 Road User Categories

This study clearly identifies pedestrians as the most vulnerable road users. This may be an indication that perhaps, there is not sufficient separation between walkways,

overpasses and traffic lanes. Enforcement of existing boundaries through enacting and tightening of existing by-laws to the effect is one of the possible solutions. This could be coupled by erecting or improving of the existing borders and barriers.

5.2.3. Day, Time seasonal trends and Location

Pedestrian deaths peak at specific times and on specific days of the week. Improved signage to improve visibility is a possible solution. Campaigns and civil activism about the association between time and days of the week when pedestrians are most at risk could provide a useful tool to prevent such pedestrian fatalities. Use of mass media, education, and environmental manipulation have in places found to be an effective tool in disseminating information about, identifying and manipulating unsafe sections of the motor ways.

5.2.4. Population groups

This study has demonstrated that the black and coloured population groups are the most vulnerable. This could be addressed by targeting the socio-economic and cultural factors that are blamed for this. It has been suggested that there is overall, less traffic controlling in townships where the use of pavements for economic activity is rampant. The use of specific traffic calming techniques such as road blocks, speed humps and other forms of barriers, as well as statutory enforcement of by-laws that govern the use of pavements for economic use could be implemented.

5.2.5 Alcohol consumption

The high incidence of pedestrian deaths with high blood alcohol concentration suggests a strong link between alcohol consumption and pedestrian mortality. Education, enforcement, visible policing, and police vigilance could play a significant role in curbing fatalities. Campaigns from advocacy groups, the use of mass media and road shows could be some of the avenues that could be used to disseminate and raise awareness on the dangers of drinking and driving. Regulating commercial advertising of alcohol could be one of the tools used to curb the abuse of alcohol. In South Africa, the

Minister of Transport has recently hinted on proposing the legislation that would increase the use access to and the use of alcohol from the age of 18 to 21.

5.2.6 Emergency medical services

This study has shown that most pedestrians never received any form of emergency medical care, raising the possibility that had they received medical care, some could have been saved. Emergency medical services, especially Human resource services need to be beefed up, especially on those times and days of the week when most pedestrian deaths occur, such as on weekends in the evenings, and over festive seasons. Extra staff could be sourced for instance through the use the use of volunteers, just like the Police use Reservist. Emergency service vehicles should ideally be equipped with modern tracking and navigational aids such as GPS, so that when notified of the whereabouts of victims, they should find them with ease. In the recent past, Emergency services ambulance crew have become victims of hijackings and rape. The safety of these crews needs to addressed, and as a contingency measure, armed police escort could accompany them to the scenes.

The placing of permanent Emergency medical posts on or along those sections of the roads that have a proven high pedestrian accident record.

Currently, Sanral (South African Road agency link) has placed Closed Circuit Television Cameras (CCTV) along all major motorways in Gauteng. In order to improve on the reaction time of emergency medical service to victims of accidents, CCTV monitoring could be introduced at all pedestrian accident hot spots in Soweto, beginning with those policing areas from where a high pedestrian accident rates have been reported. These CCTV's would then be linked through a real-time feed to Emergency medical services call centres, from which crews could be dispatched quickly. Such an approach .This may require Political, Social and Community activism, especially from the communities mostly affected by pedestrian deaths.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

The study, "Motor Vehicle Mortality in Soweto from 2001 to 2005", allows a number of conclusions to be drawn.

- Pedestrian mortality comprised the dominant proportion of all motor vehicle related mortality from 2001 to 2005 (compared to drivers, passengers and unspecified road user categories).
- Most pedestrian deaths occurred in the black population group, followed by coloureds
- The majority of pedestrian deaths were of the male gender group.
- Most pedestrian deaths occurred in between 1800h and 2400h, mainly over weekends.
- The majority of dead pedestrians were never attended to by Emergency Medical personnel.
- By age group, most pedestrian fatalities were adolescents and young adults followed by children.

- Blood alcohol concentrations were raised in a high percentage of those fatalities where it was possible to measure, suggesting that alcohol played a significant role in pedestrian deaths

6. Recommendations

Based on the findings of this study, a number of recommendations and suggestions are made, with regards to Advocacy, Intervention and Prevention:

6.1 A multi-sectoral approach

A **multi-sectoral approach** campaign to pedestrian injury and death prevention needs to be adopted, with more investment into Road Safety Campaigns that promote Health Education and Road Safety, based on Community participation. This could be through Government/Private Partnerships and NGO participation. Through this approach, coupled by including Community participation when planning and building safe pedestrian crossings or commercial road side infrastructures, or when proposing to implement any forms of environmental engineering, Road Safety Campaigns have a huge positive role to play.

Role player identification and co-ordination

- Identification and Co-ordination of the activities of all the role players that are involved in Service provision to road traffic victims, and in creating awareness about the problems created by road traffic, at all levels of Government and the Community is to be encouraged , through initiation of dialogue and sharing of experiences, skills and ideas.
- Such role players comprise Public /Private entities and Advocacy groups, such as The National and Provincial and Municipal Departments of Transport, Health, Police, Public Works, Education, Universities, Community based focus groups, Non Governmental Organizations such as "Arrive Alive", Interest groups such as Taxi Associations and the Automobile Association (AA) all of which are involved in raising road use awareness.
- A multi-disciplinary team composed of experts such as road and traffic engineers, traffic and conventional police, motor vehicle mechanics, social scientists and

doctors would perhaps yield more information than reports based entirely on police judgment or forensic pathology findings.

- Organisations such as AA (Automobile Association) raise awareness in traffic safety, Department of Transport's Arrive Alive campaign and the Metropolitan Police's road shows, especially during the festive season are some of the campaigns on road safety targeted at high accident zones and communities.

6.2 Improved road accident data collection and analysis

Improved road accident data collection and analysis, with emphasis on the use of modern GIS mapping systems is particularly pointed out as the way into the future, so that accident hotspots can be easily identified, thus allowing pre-emptive preventative action to be taken.

Data collection and analysis

There is a clear need to improve the quality of the data on all injuries in general, and on pedestrian deaths in particular. This report reaffirms that there are a number of methodological challenges that limit the use of this dataset and database in its present form for purposes of research and for making international comparisons. In particular, it is recommended that use of Modern GIS based data collection tools, such as hand held devices, becomes routine. This will in the short time, might be hampered by lack of training of Staff in the use of such devices, from various agencies that are involved in providing services to road traffic victims. In the long term, accurate data collection and analysis collected using accurate and consistent systems are in most probability likely to translate into accurate interpretations, thus enhancing the efficacy of monitoring trends, planning and executing interventions, and monitoring the effectiveness of interventions.

Data collection and capturing on the NIMSS Data collection form also needs to be improved. It does not cater for the inclusion of GPS coordinates for every victim of a road traffic incident, in its present form, when victim data is captured at the scene of the incident. That this specific data point be included in a revised version of the NIMSS data form is already being planned.

In addition, all Mortuary vehicles picking victims from death scenes are now equipped with GPS kits, allowing death scene co-ordinates to be plotted with accuracy.

6.3 Targeted Interventions

- This study has shown that the black male adult population and black children are the most vulnerable road users.
- For this group, use of reflector jackets for adults, and reflector arm bands for children should be implemented. This makes this age group more visible. In addition, specific education programmes in schools, for children, making the teaching of the "High way code" in schools, doing "Road shows" in schools and in communities with emphasis on road safety, as well as Initiating and implementing road safety programmes that specifically target drivers could be attempted. Drivers should be encouraged to have their vehicles regularly maintained, and should also be encouraged to keep their head lights on, even during the day.
- The study showed that most pedestrian deaths usually occurred mainly late in the evenings and in the early hours of weekend days.
- This particular aspect can be addressed through the use more visible policing, the use of random road blocks, and mobilizing of community policing fora on and around this vulnerable day and time of the week. The mass media, such as newspapers, television and radio can also be recruited into these education campaigns.
- It also showed that in those pedestrians fatalities in whom it was possible to measure blood alcohol concentration, the majority were over the legal limits.
- Tougher legislation with regards to selling of alcohol, rising the age at which individuals may buy and consume alcohol, and censoring of advertisements that portraying alcohol as a beverage that gives one power, and energy should could also be put in place.
- It was also shown that most fatalities occurred without any emergency medical intervention having been attempted. Targeted interventions with regards to the role of Emergency medical services have been elaborated on page 60 (5.2. 6).

6.4 Environmental Engineering

In this regard, the need to engage the affected communities when engineering interventions are being planned cannot be overemphasized. On the other hand, some of the interventions that have been erected are either inadequate or inappropriately placed, or simply, too few to have a significant impact on pedestrian mortality, compared to the size of the area they are intended to serve. Some interventions are not user friendly, for instance some are designed with no consideration for users that may have physical challenges, and the one shown below (Fig 5.1) are also simply too few to act as a safer and user friendly alternative routes to the preferred destinations.



Figure 5.1: An inadequate single pedestrian over bridge at the 1 km mark over the N12.

Other forms of Environmental engineering such as:-

- Improved lighting on over-bridges and other dedicated pedestrian road crossing points.
- use of reflective paint on road surfaces,
- use of traffic calming devices such as road surface humps,
- Well demarcated road side spaces where communities can engage in safe road side trade Traffic lights
- Erection of road side barriers, and repair of those that have broken down.,
- Provision of adequate and appropriately positioned safe crossing points and over-bridges,
- Road surface manipulation,
- Erection of appropriate and relevant signage.

Like mentioned before in chapter 5, Sanral (South African Road agency link) has placed Closed Circuit Television Cameras (CCTV) along all major motorways in Gauteng.

This could be tried in those areas of Soweto. CCTV monitoring could be introduced at all pedestrian accident hot spots in Soweto, initially in areas that have been identified as high pedestrian accident areas. The cameras would serve a double purpose, as through a link to Emergency medical services call centres, Emergency medical personnel could be mobilized quicker, and possibly, some victims could be saved.

Legislation to create dedicated demarcated zones in the Township, that are well supervised and safe for the use by children and their minders, for play and pleasure, and for Road side commercial activity, could enhance the legality of such zones and law enforcement and monitoring, thus ensuring that those demarcated zones are used for the purpose they were intended for in the first place.



Figure 5.2: With no lighting provided, this pedestrian over bridge over the N12 is both inadequate and un safe, especially at night

6.5 Legislation and Enforcement

Routine and enforceable Road worthiness inspections on all motorized road traffic Machines, as well as continuous “Driver Competence” monitoring are some of the interventions that have been found effective in some parts of the world. They should be tried in Soweto.

There is an urgent need to enforce by-laws that govern the sale and consumption of alcohol, those that regulate opening and closing times of shebeens, taverns and pubs. The consumption of alcohol in other than designated places is illegal, and those engaged in such activity should be sanctioned heavily.

ANNEXURES

Annexure 1: A report on blood alcohol concentration from the Forensic Chemistry laboratory

ANNEXURE 1



health

Department:
Health
REPUBLIC OF SOUTH AFRICA

FORENSIC CHEMISTRY LABORATORY
110 Joubert Street Ext., Hillbrow
P.O. Box 1080, Johannesburg, 2000
Phone: (011) 242 9700; (011) 725 3894/5
Fax: (011) 725 4731

The Manager
DIEPKLOOF FORENSIC PATHOLOGY SERVICES
PRIVATE BAG X 3
MONDEOR
2110

Laboratory Reference: JHB-PM03236/2010

AFFIDAVIT

I, Kenneth Xaba, hereby make oath and say:

1. I have a BSc in Chemistry and Botany from the University of the Witwatersrand and am in the employ of the State as a Chief Forensic Analyst at the Forensic Chemistry Laboratory of the National Department of Health, Johannesburg.
2. On 06 July 2010, the laboratory received from the DIEPKLOOF FORENSIC PATHOLOGY SERVICES, a polystyrene container, sealed with seal number FA435795, and bearing the identification mark:

DIEPKLOOF FPS DK 771/2010

3. The polystyrene container was kept in an access-controlled area until analysis.

On 28 October 2010, in the performance of my official duties, I broke the intact seal and found a blood specimen with a label attached to it bearing the following identification mark:

FA435795

4. I analysed the blood specimen by means of a process (described as per Annexure) requiring skill in chemistry, and obtained the following results:

4.1 The concentration of the alcohol in the blood specimen was 0.16 grams per 100 millilitres.

4.2 The concentration of the sodium fluoride in the blood specimen was 1.89 %.

5. The contents of this affidavit are, to the best of my knowledge and belief, true, and I am making this statement knowing that if it were tendered in evidence, I would be liable to prosecution if I intentionally stated anything I know to be false or which I do not believe to be true. Dated at Johannesburg 30 November 2010.

Kenneth Xaba
Chief Forensic Analyst

I certify that the deponent has acknowledged that he knows and understands the contents of this affidavit and has no objection to taking the prescribed oath and regards it as binding on his conscience. This affidavit was sworn to before me, and the deponent appended his signature in my presence at Johannesburg on 30 November 2010.

Salome Monokofala
Ex Officio Commissioner of Oaths
REPUBLIC OF SOUTH AFRICA

THIS DOCUMENT MAY ONLY BE REPLICATED IN FULL



ANNEXURE

1. The concentration of ethyl alcohol (hereinafter refer to as "alcohol") in blood specimens and other fluids of biological origin, is established by gas chromatography. Each sample is analyzed in duplicate as follows:
 - 1.1 Sample and internal standard (tertiary butanol) are dispensed into a headspace vial by means of a diluter/dispenser, which has been calibrated as to the correct volume.
 - 1.2 The sample contained in the vial, is equilibrated in a headspace auto-sampler and after a certain period of time, a sample of the headspace in the vial is injected on a column in a gas chromatograph. The headspace gas containing the alcohol and internal standard will flow with the mobile phase through the column where, due to interactions between the chemical compounds (alcohol and internal standard) and the column material, the compounds are separated. The two gas chromatographs are operated under different experimental conditions using columns of different polarity.
 - 1.3 At the end of the column a detector is situated which detects the chemical compounds flowing with the mobile phase through the column. The signal generated by the detector, is attenuated and captured by chromatographic software on which a chromatogram is illustrated. The chromatogram represents the detector's response, the alcohol and internal standard being observed as separate peaks, and will provide the information necessary to calculate the alcohol concentration. Alcohol and internal standard are identified by their retention times (i.e. their time of residence in the column).
 - 1.4 Gas chromatographs are calibrated before samples are analyzed. Calibration is done by using certified alcohol standards of different concentrations to obtain a calibration curve. The NATIONAL METROLOGY LABORATORY (NML) at the CSIR supplies the certified reference standards. The NML is the custodian of the national measuring standards of South Africa.
 - 1.5 Reliability of the gas chromatograph is constantly checked by having recourse to reproducibility of retention times of the compounds on the column, base-line appearance, and resolution between alcohol and internal standard peaks. In addition a quality control standard is chromatographed regularly to test instrument performance.
 - 1.6 The method is validated.
2. The concentration of fluoride in blood specimens and other fluids of biological origin, is established as follows:
 - 2.1 The fluoride concentration is determined by an ion selective electrode meter. The electrode is specific to fluoride ions. The meter is calibrated using certified sodium fluoride standards of different concentrations.
 - 2.2 The electrode is placed directly into the test tube containing the specimen and the concentration is displayed and recorded.
 - 2.3 In addition, a quality control standard is analyzed regularly during batch analysis to check instrument performance.
 - 2.4 A sodium fluoride concentration of equal or greater than 1% is considered sufficient to prevent the formation of alcohol.
 - 2.5 The method is validated.

Annexure 2: NIMSS data collection form currently in use

NIMSS DATA COLLECTION FORM

Mortuary _____ Police No. _____ Officer collecting body (Surname) _____

PM no. _____ PM Date Pathologist (Surname) _____

Date & Time of Injury Race Sex

Date & Time of Death Age Years Months

Medical treatment of injury prior to death (check only ONE) ☐ 1 None ☐ 2 Emergency care at scene ☐ 3 Hospital care

Province of injury (may differ to province of death) ☐ 1 Gauteng ☐ 7 Mpumalanga ☐ 1 Private house & yard (inc. pool) ☐ 9 Medical service area

☐ 2 W. Cape ☐ 8 Limpopo ☐ 2 Residential institute ☐ 10 Industrial & construction area, mine

☐ 3 K.Z. Natal ☐ 9 North West ☐ 18 Informal settlement/squatter camp ☐ 11 Farm, primary production area

☐ 4 E. Cape ☐ 10 Unknown ☐ 3 Bar, shebeen, N'Club, disco ☐ 12 Sea, lake, river, dam

☐ 5 N. Cape ☐ 11 Other (specify) _____ ☐ 4 Amusement park, sports area ☐ 13 Open land, beach

☐ 6 Free State ☐ 5 Road/street/highway ☐ 14 Countryside

Town of injury _____ ☐ 6 Railway track, station ☐ 15 in custody, prison

Suburb or district _____ ☐ 7 Shop, bank, retail area ☐ 16 Place unknown

Closest police station to injury scene _____ ☐ 8 School, educational area ☐ 17 Other (specify) _____

External Cause or Circumstance of Injury

☐ 1 Firearm Discharge ☐ 9 Fall/push/jump from height ☐ 17 Motor vehicle Driver ☐ 24 Abandoned baby

☐ 2 Sharp Object ☐ 10 Other fall/push/jump ☐ 18 Motor vehicle Unspecified ☐ 25 Electrocution

☐ 3 Blunt Object ☐ 11 Crushing ☐ 19 Railway casualty ☐ 26 Explosive blast

☐ 4 Strangulation, suffocation, asphyxia ☐ 12 Choking, aspiration ☐ 20 Bicycle, motor cycle ☐ 27 Natural cause

☐ 5 Hanging ☐ 13 Drowning, immersion ☐ 30 Aviation casualty ☐ 28 Unknown

☐ 6 Poisoning, ingestion ☐ 14 Lightning ☐ 21 Medical Procedure ☐ 29 Other Specific Cause

☐ 7 Poisoning, gassing ☐ 15 Motor vehicle Pedestrian ☐ 22 Sudden Infant Death

☐ 8 Burn ☐ 16 Motor vehicle Passenger ☐ 23 Abortion, still birth

Apparent Manner of Death

☐ 1 Homicide ☐ 2 Suicide ☐ 3 Accident ☐ 4 Natural ☐ 5 Undetermined

Samples Taken (check all)

☐ 1 None ☐ 2 Blood ☐ 3 Tissue ☐ 4 Other fluid

Alcohol and Other Substances (for completion by surveillance consortium staff)

Blood Alcohol Level Eye Fluid Alcohol Other Substances (Specify) _____

ANNEXURE 3



83/BI - 1663
Page 1

in terms of the Births and Deaths Registration Act, 1992 (Act No. 51 of 1992)

Space for Bar Code



9 9 9 9

Y Please refer to instructions

FILE No: _____ DATE: _____

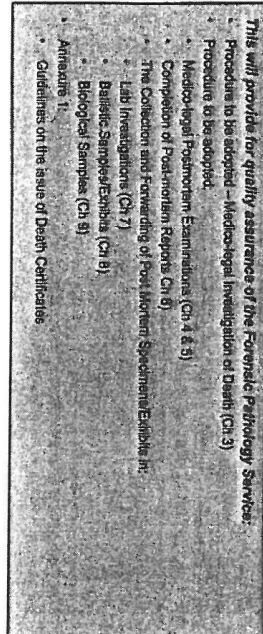
A09030250

A PARTICULARS OF DECEASED INDIVIDUAL <input type="checkbox"/> / STILLBORN CHILD <input type="checkbox"/>				Date of birth	
Identity number of deceased	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	
Surname	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			Age at last birthday <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> years	
Maiden Name (If female)	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			Sex <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	
Forenames	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			If death occurred within 24 hours after birth number of hours alive <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	
MARITAL STATUS OF DECEASED Single <input type="checkbox"/> Civil Marriage <input type="checkbox"/> Living as married <input type="checkbox"/> Widowed <input type="checkbox"/>					
Religious Law Marriage <input type="checkbox"/> Divorced <input type="checkbox"/> Customary Marriage <input type="checkbox"/>					
PLACE OF BIRTH (Municipal district or country if abroad).....					
PLACE OF DEATH (City / Town / Village).....					
PLACE REGISTRATION OF DEATH.....					
CITIZENSHIP OF DECEASED.....					
B PARTICULARS OF INFORMANT				<div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
Identity number	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			<div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
Initials and Surname	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				
Relationship to deceased	Parent <input type="checkbox"/> Spouse <input type="checkbox"/> Child <input type="checkbox"/> Other kin <input type="checkbox"/> Other (specify) <div style="border: 1px solid black; width: 50px; height: 20px; display: inline-block;"></div>				
Postal address	<div style="border: 1px solid black; height: 40px; width: 100%;"></div>				
Was the next of kin of the deceased a smoker* during the past five years? Yes <input type="checkbox"/> No <input type="checkbox"/> Refuse to answer <input type="checkbox"/>				Postal Code <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	
Date <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>				Telephone No. <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	
C PARTICULARS OF FUNERAL UNDERTAKER					
Initials and Surname <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>				<div style="border: 1px solid black; height: 100px; width: 100%;"></div>	
Designation No. <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> Place of burial / cremation.....					
Date <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> Signature.....					
D.1 CERTIFICATE BY ATTENDING MEDICAL PRACTITIONER / PROFESSIONAL NURSE					
I, the undersigned, hereby certify that the deceased named in Section A, to the best of my knowledge and belief, died solely and exclusively due to NATURAL CAUSES, as specified in Section G. <input type="checkbox"/>				Postal address <div style="border: 1px solid black; width: 100%; height: 40px; display: inline-block;"></div>	
I, the undersigned, am not in the position to certify that the deceased died exclusively due to natural causes. <input type="checkbox"/>				Postal Code <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	
Initials and Surname <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>				SAMDC / SANC Reg. No. <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>	
Date Signed <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> Signature.....				Postal address <div style="border: 1px solid black; width: 100%; height: 40px; display: inline-block;"></div>	
D.2 CERTIFICATE BY DISTRICT SURGEON / FORENSIC PATHOLOGIST					
I, the undersigned, hereby certify that a medicolegal post-mortem examination has been conducted on the body of the person whose particulars are given in Section A and that the body is no longer required for the purpose of the Inquest Act, 1959 (Act No. 58 of 1959) and that the cause of death is:				Postal address <div style="border: 1px solid black; width: 100%; height: 40px; display: inline-block;"></div>	
Natural (Cause of Death as indicated in Section G) <input type="checkbox"/> Unnatural <input type="checkbox"/> Under investigation <input type="checkbox"/>				Postal Code <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	
Initials and Surname <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>				SAMDC Reg. No. <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>	
Place of post-mortem..... Date <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>				Signature.....	
Mortuary reference..... Date signed <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>				Office Stamp	
E FOR OFFICIAL USE ONLY					
Registration of Death approved and Burial Order issued				Initials and Surname or Registrar <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>	
Postal address <div style="border: 1px solid black; width: 100%; height: 40px; display: inline-block;"></div>				Force No./ Designation No. <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>	
Postal Code <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> Date <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>				Peral No. <div style="border: 1px solid black; width: 100%; height: 20px; display: inline-block;"></div>	
Signature.....				Office Stamp	

* Someone who smokes tobacco on most days

Annexure 4: Pages 2-5 extracted from the National code of Guideline for Forensic Pathology practice in South Africa, detailed the relevant legal framework for investigating un-natural deaths.

SECTION B: FORENSIC PATHOLOGY PROFESSIONAL PRACTICE STANDARDS FOR SA



CHAPTER 3 PROCEDURE TO BE ADOPTED IN THE MEDICO-LEGAL INVESTIGATION OF DEATH

Introduction

11. The Inquests Act specifically provides for the examination, including dissection, of a body and the removal, if necessary, of specimens for special investigation. The decision as to whether the medical practitioner charged with the examination (the authorized person in terms of the Regulations) will or will not dissect the body or remove any part, organ or contents for investigation is entirely at his/her discretion. This responsibility is a most important one since, in a case in which death is due to unnatural causes and for which some person may be held criminally liable, failure to carry out an adequate investigation may lead to the irremediable loss of evidence that may later prove to be of great legal importance, thereby seriously compromising the administration of justice.
12. The medical practitioner must therefore endeavour to gather any evidence that may facilitate the administration of justice together with his/her attempt to establish the cause of death. The aim of the medico-legal investigation of death is to establish the primary medical cause of death as well as the probable mechanism and circumstances of death. Any information or evidence accompanying the body which may be of importance in subsequent civil or criminal judicial proceedings should therefore be noted, collected and investigated.
13. It is desirable in the interests of economy, that unnecessary autopsies and special laboratory investigations should not be performed.
14. The authorised person should, however, therefore carefully consider all the facts when deciding what procedure must be followed and is personally accountable for any neglect to make, or cause to be made, as adequate an investigation as circumstances require.

The Births and Deaths Registration Act and Natural Deaths:

15. In cases admitted to a designated facility, where there are no suspicious circumstances to suggest that the death was due to unnatural causes and there are statements to that effect, and where there is no other medical practitioner willing to certify that the death was due to natural causes, the forensic medical practitioner (authorised person) should carry out an investigation consisting of:
 - interviews, if need be in conjunction with the police officer who is investigating the circumstances of the death, with persons who may be able to give evidence regarding the nature of the deceased's last illness;
 - consultation with any medical practitioner who recently attended the deceased; and
 - an inspection of the dead body.
16. If after the above investigation, the authorised person is of the opinion that the death was exclusively due to natural causes, a dissection of the body may be unnecessary and a certificate (form B11663) may be issued, stating the cause of death to the best of his/her knowledge.
17. If after the above investigation, the cause of death remains obscure and the authorised person is unable to issue a death certificate stating the cause of death, an autopsy should be performed.
18. If the above investigation suggests that the death may have been due to unnatural causes, the case should be regarded as falling under the Inquests Act. These cases usually represent cases of sudden unexpected or unattended death. Special care should be taken in cases where the death was not attended by a person with medical background. In cases where advanced decomposition is present, or cases where minimal information is available.

Deaths which fall under the Inquests Act (Unnatural Deaths):

19. If a partial dissection reveals that the death was unquestionably due to natural causes, further dissection is not essential and a certificate (form B1 1663) stating the cause of death must be issued. In addition, a brief autopsy report must be compiled.
20. If the death appears to be due to unnatural causes, especially if there is a possibility that criminal proceedings may follow, the authorised person should perform a complete autopsy as per paragraphs 33 - 38. It is advised that this procedure should be followed in all cases of doubt.

Deaths associated with anaesthesia

21. Section 56 of the Health Professions Act stipulates that the death of a person whilst under the influence of a general or local anaesthetic, or to which the administration of an anaesthetic has been a contributory cause of death, must be regarded as a death due to unnatural causes.
22. The investigation of such death should be managed in consultation with the most senior regional or provincial forensic pathologist. This consultation can include, but is not limited to, a telephonic consultation.
23. Any death reported under this section, whatever its apparent cause clinically or by post mortem examination, must always be regarded as a death due to unnatural causes. A complete post mortem examination must be performed in all these cases as per paragraphs 33 - 38.

Deaths of persons in custody

24. For the purpose of this section, 'custody' means, the period starting from detention / arrest by a law enforcement agency, until release or conviction, which includes e.g. the 'awaiting trial' detainees in SAPS

- establish the independence of professionals in the Service
- ensure that the Service is rendered within a uniform system;
- provide for participation of society in the Service;
- ensure the service is equitable;
- ensure the service is efficient and cost-effective;
- ensure the promotion of relevant education, training and research;
- rectify the deprived state of the Service;
- provide for the specific needs of those persons rendering the Service; and
- establish adequate data collection and processing.

CHAPTER 2 LEGAL REQUIREMENTS OF IMPORTANCE AT THE PERFORMANCE OF A MEDICO-LEGAL AUTOPSY:

6. Important legal requirements regarding the medico-legal investigation of death are contained in, amongst others, the Inquest Act, the Criminal Procedure Act, the National Health Act, the Births and Deaths Registration Act and the Health Professions Act.

Certificate by medical practitioner

7. In terms of the Births and Deaths Registration Act, a certificate (Notification / Register of Death / Stillbirth - B1 1663) stating the cause of death, must be issued promptly where appropriate.
8. The Births and Deaths Registration Act states that:
 - Section 15(1) Where a medical practitioner is satisfied that the death of any person who was attended before his death by the medical practitioner was due to natural causes, he shall issue a prescribed certificate stating the cause of death.
 - Section 15 (2) A medical practitioner who did not attend any person before his death but after the death of the person examined the corpse and is satisfied that the death was due to natural causes, may issue a prescribed certificate to that effect.
 - Section 15 (3) If a medical practitioner is of the opinion that the death was due to other than natural causes, he shall not issue a certificate mentioned in subsection (1) or (2) and shall inform a police officer as to his opinion in that regard.
 - Section 17 (1) After an investigation as to the circumstances of a death due to other than natural causes in terms of section 3 of the Inquests Act, 1959... the medical practitioner concerned shall, as soon as he is satisfied that the corpse concerned is no longer required for the purposes of an examination mentioned in the said section 3, issue a prescribed certificate to that effect and deliver it to the police officer concerned.
 - Section 17 (2) After the certificate referred to in subsection (1) has been issued, the police officer concerned, or any person contemplated in section 4, as the case may be, may, on the basis of the said certificate, complete the prescribed death register, without stating a cause of death, and the police officer concerned or the person contemplated in section 4, as the case may be, may issue the prescribed burial order authorising burial.
 - Section 18 (1) A medical practitioner who was present at a stillbirth, or who examined the corpse of a child and is satisfied that the child was still-born, shall issue a prescribed certificate to that effect.
 - Section 18 (2) If no medical practitioner was present at the still-birth, or if no medical practitioner examined the corpse of a still-born child, any person who was present at the still-birth shall make a prescribed declaration thereanent to any person contemplated in section 4.

Unnatural deaths

9. For the purposes of the medico-legal investigation of death, (as defined in the Regulations pertaining to the National Health Act no 61 of 2003), the following shall be deemed to be deaths due to unnatural causes:
 - (a) any death due to physical or chemical influence, direct or indirect, and / or related complications;
 - (b) any death, including those deaths which would normally be considered to be a death due to natural causes, which in the opinion of the medical practitioner, has been the result of an act of commission or omission which may be criminal in nature;
 - (c) any death as contemplated in section 56 of the Health Professions Act, Act 56 of 1974 ("The death of a person whilst under the influence of a general anaesthetic or local anaesthetic, or of which the administration of an anaesthetic has been a contributory cause, shall not be deemed to be a death from natural causes as contemplated in the Inquests Act, 1959 (Act 58 of 1959), or the Births and Deaths Registration Act, 1992 (Act 51 of 1992); and
 - (d) where the death is sudden and unexpected, or unexplained, or where the cause of death is not apparent;
10. The Inquests Act, 58 of 1959, provides for the holding of inquests in cases of deaths due to other than natural (unnatural) causes. Sections 2 and 3 deals with the duty to report deaths and the investigation of the circumstances of certain deaths. The Inquests Act states:
 - Section 2 (1) Any person who has reason to believe that any other person has died and that the death was due to other than natural causes, shall as soon as possible report accordingly to a policeman unless he has reason to believe that a report has been or will be made by any other person.
 - Section 3(1) Subject to the provisions of any other law providing for an investigation of the circumstances of any death, any policeman who has reason to believe that any person has died and that such a person has died from other than natural causes, shall -
 - i. Section 3 (1) (a) investigate or cause to be investigated the circumstances of the death or alleged death, and
 - ii. Section 3 (1) (b) report or cause to be reported the death or alleged death to the magistrate of the district concerned, or to a person designated by the magistrate, and
 - iii. Section 3 (2) If the body of the person who has allegedly died from other than natural causes is available, it shall be examined by the district surgeon or any other medical practitioner, who may if he deems it necessary for the purpose of ascertaining with greater certainty the cause of death, make or cause to make an examination of any internal organ or any part or any of the contents of the body, or any other substance or thing.
 - iv. Section 3 (3) For the purposes of any examination mentioned in subsection (2) -
 - Section 3 (3) (a) any part or internal organ or any of the contents of a body may be removed there from;
 - Section 3 (3) (b) a body or any part, internal organ, or any part of the contents of a body so removed there from may be removed to any place.
 - v. Section 4 A body which has already been interred may, with the permission of a magistrate or attorney-general within whose area of jurisdiction it has been interred, be disinterred for the purpose of any examination mentioned in subsection (2).

Annexure 5: Ethical approval for the study, issued by the Human Research Ethics committee of the University of Witwatersrand

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

R14/49 Mwesigwa

CLEARANCE CERTIFICATE

PROTOCOL NUMBER M080337

PROJECT

Motor Vehicle Pedestrian mortality in
Soweto from 2001 - 2005

INVESTIGATORS

Dr JB Mwesigwa

DEPARTMENT

School of Public Health

DATE CONSIDERED

08.03.25

DECISION OF THE COMMITTEE*

Approved unconditionally

+

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE

08.04.15

CHAIRPERSON



(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Dr K Tint

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10004, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. I agree to a completion of a yearly progress report.

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

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